EFFECTS OF ACOUSTIC AND VORTICAL DISTURBANCES ON THE TURBULENT BOUNDARY LAYER AT FREE-STREAM MACH NUMBER 0.5

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An experimental investigation of the effects of free-stream disturbances on the development of a turbulent boundary layer is described. The data, obtained at a free-stream Mach number of 0.5, indicated: (1) compared to the baseline acoustic disturbances of 133 db, acoustic disturbances of up to 150 db did not significantly alter the turbulent boundary-layer skin friction, displacement thickness, or momentum thickness and (2) compared to

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20. ABSTRACT (Continued)

the baseline vortical disturbances of 0.5 percent of the free-stream velocity, vortical disturbances of one percent of the free-stream velocity considerably altered the boundary-layer skin friction, displacement thickness, and momentum thickness, as well as their growth rates.

PREFACE

The work reported herein was conducted by the Arnold Engineering Development Center (AEDC), Air Force Systems Command (AFSC), under Program Element 65807F. The results were obtained by ARO, Inc., AEDC Division (a Sverdrup Corporation Company), operating contractor for the AEDC, AFSC, Arnold Air Force Station, Tennessee, under ARO Projects No. P32P-31B and P32A-B1A. The manuscript was submitted for publication on May 24, 1977.

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1.0 INTRODUCTION

The effects of certain secondary flows on the quality of wind tunnel data have been of historical concern to aerodynamicists. Commonly known as free-stream disturbances, these secondary flows are perturbations of the mean flow field and are usually characterized by the magnitude of the root-mean-square (rms) values of the fluctuating velocity vector and pressure field. Early investigators examined the influence of free-stream disturbances on the onset of boundary-layer transition (e.g., see Ref. 1). Recently, attention has been focused on changes induced in the development of the turbulent boundary layer caused by the presence of these disturbances. Several investigations (Refs. 2 through 6) have been made in which the growth of the flat plate boundary layer has been perturbed by vortical disturbances (turbulence) issuing from grids placed in the mean flow. Tripped boundary layers were employed in these studies in an effort to remove effects of the disturbances upon transition onset. However, the aforementioned investigations have been concerned primarily with the low-speed flow regime (i.e., $u_\infty < 50$ m/s), and the extent of the applicability of these results to higher speed ranges is unknown.

The results of Refs. 2 through 6 are complementary and are briefly summarized below. The effect of increasing the magnitude of vortical disturbances as measured by $\tilde{u}_{rms}$ is to:

1. Increase the boundary-layer thickness, $\delta_{0.99}$ ($u/u_\infty = 0.99$), δ^*, and θ. (When $\tilde{u}_{rms}$ becomes greater than about two percent, δ^* and θ begin to decrease (Ref. 4).

2. Increase the fullness of the velocity profile, and consequently, reduce the wake component, the velocity defect, and increase the skin friction coefficient, C_f.

3. Alter the distribution of the mixing and dissipation length across the boundary layer.

4. Increase the local magnitude of $\tilde{u}_{rms}$, $\tilde{v}_{rms}$, $\langle\rho\tilde{u}\tilde{v}\rangle$, and $\langle\tilde{q}^2\rangle$, as well as the ratio $\langle\tilde{q}^2\rangle/\langle\rho\tilde{u}\tilde{v}\rangle$.

5. Cause the Reynolds stress component $\langle\rho\tilde{u}\tilde{v}\rangle$ to retain significant values for $y > \delta$.

6. Cause the boundary layer to tend to lose its equilibrium characteristics in the sense that the profiles become nonsimilar in u/u_∞ and y/δ^* coordinates.

Investigations of a similar nature have not been conducted using acoustic disturbances. However, a low-speed study (u_∞ ~ 40 m/s) into the effect of acoustic radiation on boundary-layer heat flux has been conducted by Gouget (Ref. 7). Although the results of this experiment cannot be directly compared to those of Refs. 2 through 6, as they were conducted utilizing an untripped boundary layer with free transition, they do provide evidence suggesting acoustic disturbances up to 149 db do not affect skin friction.

The experiment described herein was designed to extend the study of the effect of free-stream disturbances on the growth of a turbulent boundary layer to a higher speed regime, specifically, M = 0.5 (u_∞ ~ 170 m/s) and to include the effect of both vortical and acoustic disturbances. In particular, the effect on the mean properties of the turbulent boundary layer such as C_f, δ^*, θ, and H was sought for the purpose of ascertaining the importance of free-stream disturbances in high subsonic and transonic wind tunnel testing.

The Arnold Engineering Development Center (AEDC) Acoustic Research Tunnel (ART) of the Propulsion Wind Tunnel Facility (PWT) was selected as a suitable test facility to conduct these experiments because it was specifically designed to provide a relatively low disturbance environment for the speed range $0.2 \leq M \leq 1.1$. Perturbations of various types can readily be imposed upon the tunnel baseline disturbance level by addition of an appropriate generator. A complete description of the apparatus, experimental procedure, and results follows.

2.0 APPARATUS

2.1 ACOUSTIC RESEARCH TUNNEL

The ART is an atmospheric indraft, continuous flow wind tunnel having a 15.2- by 15.2- by 61-cm test section and a Mach number range of $0.2 \leq M \leq 1.1$. Mach numbers above $M = 0.7$ are obtained through use of porous walls and plenum suction. A schematic, with significant dimensions, is presented in Fig. 1.

A relatively low background acoustic level is obtained in the test section by means of acoustic silencers (46-db maximum attenuation rating at 1.2 kHz) in the diffuser and plenum exhaust ducts, as well as vibration isolation expansion joints. Honeycomb and damping screens installed in the inlet section further reduce the acoustic and vortical background levels. Because the exhaust machinery is remotely located with respect to the tunnel, fan noise is not transmitted back into the test section. Background noise levels attained in the test section when configured with solid walls are shown in Fig. 2 in the form of overall sound pressure level (i.e., $\tilde{p}_{rms}$ in db). The figure also presents these data in terms of the acoustic parameter ΔC_p where

$$\Delta C_p = \left(\tilde{p}_{rms} / q_\infty\right) \times 100\%$$

and where $\tilde{p}_{rms}$ is the rms fluctuating pressure and q_∞ is the dynamic pressure evaluated at the free-stream conditions. From these data, the nominal level of ΔC_p = 0.45 percent is approximately the level to be expected from acoustic radiation produced by a turbulent boundary layer on the solid test section walls as compared to $1.0 \leq \Delta C_p \leq 2.0$ percent for a typical transonic, porous wall wind tunnel (see, e.g., Ref. 8). The 61-cm length of the test section was deemed to be insufficient to allow a significant range of length Reynolds numbers to be examined. Therefore, the test section was made extendible by the addition of a channel with dimensions 15.2 by 15.2 by 61 cm. The channel can be inserted between the nozzle contraction section and the plenum housing thus providing a test section length of 122 cm or an additional 61 cm for boundary-layer growth.

2.2 DISTURBANCE GENERATORS

Two types of acoustic generators were examined for use in this investigation. The first was a two-dimensional variable width slot which acted as an edgetone generator. The slot was installed in the upper test section wall and was open to the plenum chamber. In order to obtain a stable operating condition, it was necessary to employ plenum suction. Because plenum suction jeopardized the two-dimensional flow in the test section and because the resultant noise levels were found to be inadequate ($\tilde{p}_{rms}$ ~ 139 db compared to 133-db baseline), this generator was not utilized. The second generator was a variable porosity wall with 1.3-cm-diam holes inclined at 60 deg to the mean flow (PWT Aerodynamic Wind Tunnel (4T) (Tunnel 4T) porous wall hole pattern). The Tunnel 4T wall is made of two plates which may be moved relative to each other. This allows the effective wall porosity to be varied from zero to six percent. When configured in the zero-porosity mode (i.e., no flow through the walls), it was found to be an effective noise generator with $\tilde{p}_{rms} \approx 149$ db. The performance of this acoustic generator is summarized in Figs. 3 and 4.

The vorticity generator consisted of a rod mesh constructed from 2.54-cm-diam horizontal rods and 1.91-cm-diam vertical rods with a grid spacing of 6.4 cm. The grid was installed in the tunnel stilling chamber at a distance of approximately 50 cm upstream of the nozzle contraction section. This configuration yielded a nominal disturbance level of $\tilde{u}_{rms}$ ~ one percent in the test section, a level which was thought to be typical of porous wall wind tunnels. This level remained essentially unchanged for runs made with the test section extension installed.

2.3 INSTRUMENTATION

A pitot probe was made by flattening a 0.17-cm-diam seamless 304 stainless steel tube having a 0.02-cm wall thickness. The resulting, approximately rectangular, opening measured 0.005 cm high by 0.25 cm wide. The wall thickness of the flattened portion of the probe was gradually reduced over a distance of about 1.5 cm to about 0.0025 cm at the probe tip. This design reduced the vertical distance over which the wall induced errors in the measurement of pressure (see, e.g., Ref. 9) and allowed negligible probe deflection under wind loading.

Tunnel static pressure orifices of 0.8-mm diameter were located along the nozzle wall at 1.27-cm intervals. Static orifices were similarly spaced along the tunnel test section lower wall and along the test section extension. These orifices were connected through a patch panel to the standard ART pressure measurement systems discussed below by means of plastic tubing.

A traversing mechanism was designed to provide probe-positioning accuracies to within 0.08 mm. A traversing rate of 0.38 cm/min was achieved by a gearbox which reduced the motor speed by a ratio of 1,000:1. Antibacklash gears and a magnetic brake (oversized compared to motor torque) ensured a dead stop of the probe without coasting when the power

to the drive motor was interrupted. Probe position was accurately determined to within 0.0025 cm by a linear potentiometer which was mounted to the traversing strut. The lower test section wall had three penetrations for the traversing mechanism which were located at separate locations along the tunnel axial centerline. The installed configuration is illustrated in Fig. 5.

The pitot probe and tunnel static pressures were converted to a d-c electrical signal by a Kistler® series 314 0 to 10^5 pascal (0 to 15 psi) pressure transducer. The electrical signal was read on a Fluke® model 8400 digital voltmeter and hand recorded. The various pressures were routed to the transducer via two 12- port Giannini® scanning valves.

A 0.64-cm-diam Bruel and Kjaer® condenser microphone was used to measure the tunnel sound pressure level $\tilde{p}_{rms}$. The microphone was flush mounted to the test section sidewall at tunnel station 47.63 cm.

A Thermo-Systems, Inc.®, Model 1248, X-array cylindrical film anemometer was used to measure vorticity levels (i.e., $\tilde{u}_{rms}$). The anemometer was mounted in the traversing mechanism and traversed out of the boundary layer to determine the local free-stream vorticity level.

The output of the microphone was hand recorded from readings taken on a true-root-mean-square voltmeter with an internal one-second time constant. The voltmeter readings were averaged over a minimum time of five seconds. Mean square values of the anemometer signals were obtained by operating the true-rms voltmeter in the signal-squaring mode and passing the squared voltage into a signal integrator whose time constant was set at 100 sec (the maximum value). The averaged signals were then hand recorded and converted into $\tilde{u}_{rms}$ by an offline computer program. (Alternate measurement techniques are discussed in Appendix A.)

3.0 EXPERIMENTAL PROCEDURE

The experimental procedure used is summarized as follows: (1) A particular combination of tunnel configuration, test section and probe location, and disturbance generator was selected and installed. The choices of tunnel configuration were limited to the standard version as per Fig. 1 with solid walls and the modified version which included the test section extension. Disturbance generators were restricted to either the zero-porosity Tunnel 4T wall for acoustic disturbances or the rod mesh for vortical disturbances. Baseline data were obtained with no disturbance generators and solid test section walls. (2) Pretest calibration of the instrumentation was completed. (3) The desired flow conditions were established at the nozzle exit, and the appropriate instrument readings were noted and hand recorded. Detailed procedures regarding calibration, data acquisition, and data reduction are presented in the following subsections.

3.1 CALIBRATION

The linear potentiometer used to indicate the position of the traversing mechanism with respect to the tunnel wall was calibrated before each run. It was necessary to establish only two points because of the high linearity and repeatability of the potentiometer. The zero or wall point was set by traversing the probe to the wall. An electrical circuit was completed and triggered a light indicator when contact was made between the bottom of the probe tip and the tunnel wall. To set the span, or maximum distance from the wall, a precision-machined metal block, 1.3 or 1.9 cm in height, was set on the tunnel floor. Again, the electrical circuit was used to establish contact between the probe tip and the top of the block. Choice of block height was made on the basis of expected boundary-layer thickness.

The microphone was calibrated in situ before each run by application of 140-db sound pressure level at a frequency of 1 kHz to the microphone diaphragm by means of a piston phone. The piston phone had a certified accuracy of ±0.5 db. The Kistler pressure transducer was calibrated before each run. The zero point was established by venting both sides of the transducer to atmosphere. The span was set by loading the pressure side of the transducer with a known pressure while the reference side was exposed to a vacuum. During the course of the experiment, it was found that both the microphone and the Kistler transducers maintained their calibrations over periods of several weeks.

3.2 DATA ACQUISITION

After completion of the pretest calibrations, the desired tunnel mean flow conditions were established. Records were then made of the primary tunnel operational parameters: total pressure, total temperature, tunnel nozzle and test section axial static pressure distribution, as well as acoustic and vortical disturbance levels. Figure 6 illustrates a typical tunnel empty axial pressure distribution. Data for both tunnel configurations are included in Fig. 6 and clearly indicate that the distribution is not significantly affected by the addition of the test section extension for the conditions of the experiment. Axial pressure data taken with the traversing probe installed exhibited no variation from the distribution of Fig. 6 upstream from the probe location.

Boundary-layer pitot profile data were obtained by traversing the pitot probe into the free-stream flow and then systematically traversing the probe toward the wall. The free-stream condition was verified by ensuring that a minimum of three consecutive points maintained essentially a constant pitot pressure. The probe was moved toward the wall in 0.06-cm steps to a height of 0.25 cm from the wall. At this point, steps of 0.05 cm were maintained until the probe contacted the wall.

The profile data were augmented by making repeat measurements at intermediate probe locations by traversing the probe away from the wall to an initial distance of 0.025 cm and then traversing away from the wall in steps of 0.05 cm. These additional points were generally restricted to the first 0.30 to 0.40 cm of the boundary layer; however, the exact distance was determined upon data repeatability and boundary-layer thickness.

Probe position and pressure data were hand recorded and the ratio P_T/P_{T_∞} computed. Typically, a plot of P_T/P_{T_∞} versus y was made as the data were being acquired to ensure that a smooth, well-defined profile was being obtained. This procedure was necessitated by fluctuations in pitot pressure of three percent in the free-stream total pressure to as much as ten percent of the local total pressure in the boundary layer. Considerable effort was expended to ascertain the cause of these fluctuations and assess their effects on the profile data. It was subsequently found that simultaneous operation with Tunnel 4T was inducing the observed free-stream flow unsteadiness.* A comparison of data obtained when the ART was operated alone was found to agree with the data obtained during simultaneous operation of the ART and Tunnel 4T to within the experimental scatter. Therefore, it was concluded that the observed flow unsteadiness was not adversely affecting the data when sufficiently long averaging times were allowed.

*This occurs because the automatic pressure system used to maintain flow conditions in Tunnel 4T continually adjusts the stagnation pressure of that tunnel, and the resultant pressure fluctuations eventually feed through to the ART test section when both tunnels are operated simultaneously.

3.3 DATA REDUCTION

The recorded values of probe position and pitot pressure ratio (i.e., y and P_T/P_{T_∞}) together with tunnel total temperature and pressure, and mean flow Mach number were punched on computer cards and input into a data reduction program. The measured pitot pressure ratios were converted into the corresponding velocity ratios (i.e., u/u_∞). The calculation procedure first determined the local Mach number ratio M/M_∞ from the Rayleigh pitot equation. The definition of Mach number was then employed to obtain the relation

$$\frac{M}{M_\infty} = \frac{u}{u_\infty}\sqrt{\frac{T_\infty}{T}}$$

The Crocco-type relation for nonunity Prandtl numbers and adiabatic walls developed in Ref. 10 was used as a second equation for the two unknowns, u/u_∞ and T/T_∞, i.e.,

$$\frac{T}{T_\infty} = 1 + \frac{\gamma-1}{2}M_\infty^2\left[1-\left(\frac{u}{u_\infty}\right)^2\right] + (1-Pr_m)\left\{\frac{\beta(\gamma-1)M_\infty^2}{(\alpha+1)(\alpha+2)}\left[1-\left(\frac{u}{u_\infty}\right)^{\alpha+2}\right]\right.$$

$$\left. + \frac{\gamma-1}{2}M_\infty^2\left[1-\left(\frac{u}{u_\infty}\right)^2\right] + f(1) - f\left(\frac{u}{u_\infty}\right)\right\}$$

where

$$f\left(\frac{u}{u_\infty}\right) = \frac{\Delta}{(\gamma-1)M_\infty^2}\left[(\zeta-\Delta)\ln|\zeta-\Delta| - (\zeta+\Delta)\ln|\zeta+\Delta|\right],$$

$$\zeta = -(\gamma-1)M_\infty^2\frac{u}{u_\infty}, \quad \Delta = \left[2(\gamma-1)M_\infty^2\frac{T_{T_\infty}}{T_\infty}\right]^{1/2}$$

$\alpha = 17.5$, $\beta = 70$, and Pr_m is the mixed Prandtl number. These last two equations were solved simultaneously by Newton-Raphson iteration for the local values of u/u_∞ and T/T_∞ using a recovery factor of 0.88. The resultant profiles were then integrated using the trapezoidal rule to obtain the boundary-layer parameters δ^*, θ, and H. The value of skin friction, C_f, associated with the measured profile is then found from a fit of the data to the compressible law of the wall as formulated by Fenter and Stalmach (Ref. 11):

$$\frac{\sin^{-1}\left(\sigma^{\frac{1}{2}}\frac{u}{u_\infty}\right)}{\left(\sigma\frac{C_f}{2}\frac{T_w}{T_\infty}\right)} = 5.75 \log\left[\mathrm{Re}\ y\frac{\mu_\infty}{\mu_w}\left(\frac{C_f}{2}\frac{T_w}{T_\infty}\right)\right]^{\frac{1}{2}} + 5.1$$

where $\sigma = \frac{\gamma-1}{2} M_\infty^2/(1 + \frac{\gamma-1}{2} M_\infty^2)$ and μ is the laminar viscosity.

The Wall-OverLap Layer (WOLL) model developed in Ref. 12 for the inner portion of a turbulent boundary layer was utilized in conjunction with the inferred value of C_f to compute corrections to δ^*, θ, and H. The corrections are implemented by using the WOLL model and C_f to add additional points to the measured velocity profile in the region

$$y^+ = y\ \mathrm{Re}\ \sqrt{\frac{\rho_\infty}{\rho_w}\frac{C_f}{2}} < 140$$

where data are generally not available. These augmented profiles, which typically involved two or three percent of the total boundary layer, were then integrated to yield the corrected values of δ^*, θ, and H. For the data reported herein, these corrections generally varied between three and five percent of the uncorrected values. However, occasionally much larger variations were observed, particularly in the thinner boundary layers (e.g., see Run No. 76-25 in Table 1 where $\Delta\delta^*/\delta^* = 12.8$ percent, $\Delta\theta/\theta = -6.13$ percent, and $\Delta H/H = 20.2$ percent).

4.0 RESULTS AND DISCUSSION

4.1 BOUNDARY-LAYER TRIP

The introduction of disturbances in the mean flow may be expected to have two effects on the boundary layer: (1) a change of the location of the transition to turbulence and (2) alterations to the boundary layer after it has become turbulent. In order to examine this latter effect, which was the objective of these experiments, it was necessary to fix the transition point. Therefore, the criteria of Braslow (Ref. 13) and Braslow, et al., (Ref. 14) were employed to locate a boundary-layer trip in the tunnel contraction section. The trip was of the

three-dimensional type and consisted of conical indentations stamped in a 6.35-mm-wide strip of 0.05-mm shim stock. The indentations were spaced at intervals of 1.2 mm and protruded 0.07 mm above the surface of the shim stock.

Experiments were conducted to ensure that the boundary layer became turbulent at the trip location, did not move upstream when disturbances were introduced, and did not relaminarize downstream of the trip. Three glue-on-type surface film anemometers were installed in the nozzle contraction section and were located 4 cm upstream and 4 and 15 cm downstream of the trip location. The gage outputs were monitored under conditions of maximum and minimum acoustic and vortical disturbance levels. From the amplitude-time signals of these gages, it was inferred that the boundary layer did not relaminarize and that it became and remained turbulent within 4 cm of the trip location. It was not possible to draw more definite conclusions because of the limited frequency response of the available instrumentation.

4.2 RESULTS

Skin friction data collected from a number of tunnel entries are displayed in Fig. 7. The skin friction coefficient, C_f, is seen to correlate with momentum thickness Reynolds number, R_θ, to within approximately ten percent, regardless of the presence of mean flow disturbances. This correlation is of interest in that it was not observed in the data of Huffman, et al., (Ref. 3) or in that of Evans (Ref. 4) where $\tilde{u}_{rms}$ varied along the tunnel axis. If all data but that obtained during the final tunnel entry are excluded, the scatter observed in Fig. 7 may be reduced to about five percent as shown in Fig. 8. The improvement in consistency of the data from a single tunnel entry is attributed to the elimination of slight tunnel configuration variations which arise from small but unavoidable tunnel misalignments between tunnel entries. Therefore, only the data presented in Fig. 8 will be considered in detail. Tabulations of these data can be found in Table 1.

The relative effects of the acoustic and vortical disturbances on the boundary-layer parameters C_f, δ^*, θ, and H are best illustrated when they are presented as functions of length Reynolds number, R_x. In this case, x is measured from the trip location. Figure 9 illustrates $C_f(R_x)$, $\delta^*(R_x)$ and $\theta(R_x)$ and $H(R_x)$. Acoustic levels of 149 db are observed to have no discernible effect on these parameters when compared to the baseline values obtained at 133 db. However, increasing the vortical disturbance level from the baseline value of $\tilde{u}_{rms}$ = 1 percent* is seen to noticeably alter the magnitudes, as well as the rates of change of these parameters with respect to R_x. In the case of the shape factor (Fig. 9d), the vortical disturbances reverse the trend of increasing H with increasing R_x. That is, H exhibits a slight decrease with R_x increasing.

The dimensionless velocity profiles at each axial location are compared in Fig. 10. With the exception of the farthest upstream profile at x = 76.2 cm, the presence of mean flow disturbances increases the fullness of the profiles. In particular, the vortical disturbances induce the greatest degree of fullness in the velocity profile in each case consistent with the decreasing trend of H noted in Fig. 9. These data are compared in velocity defect coordinates in Fig. 11. This figure indicates that the vortical disturbances reduce the velocity defect, a result consistent with the fuller profiles. Finally, a comparison of data in law of the wall variables (i.e., y^+, u^+) is made in Fig. 12. A decrease in magnitude of the wake component when vortical disturbances are present is noted. However, with the exception of the data at x = 137.2 cm, an increase in the wake component is observed when acoustic disturbances are present.

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*The values of $\tilde{u}_{rms}$ quoted here must be considered to be nominal levels only. The quoted values are based upon agreement between hot-wire and LV data obtained on the tunnel centerline. A more detailed discussion of the difficulties encountered in the measurement of $\tilde{u}_{rms}$ is given in Appendix A.

5.0 SUMMARY OF RESULTS

In summary, the effect of increased vortical disturbances in the ART from the baseline value of $\tilde{u}_{rms}$ = 0.5 percent to the maximum value of $\tilde{u}_{rms}$ = one percent was observed to (1) increase the fullness of the velocity profile and increase C_f and (2) decrease the magnitude of δ^*, θ, dC_f/dx, $d\delta^*/dx$, $d\theta/dx$, dH/dx, the velocity defect, and the wake component of the profile. These findings are in accord with those of previously quoted investigators (Refs. 2 through 6).

Acoustic disturbances characterized by an increase in $\tilde{p}_{rms}$ from 133 db to 149 db did not discernibly affect the development of the turbulent boundary layer with the possible exception of an increase in the magnitude of the wake component.

It is noted that the axial gradients of C_f, δ^*, θ, and H do not correspond to flat plate variations and, therefore, may be influenced by the developing channel flow. However, all comparisons which have been made describe relative changes of the basic tunnel flow caused by the various disturbances. Also, the data reduction procedure used to determine C_f was based upon the implicit assumption that the law of the wall could be applied to flow containing disturbances. That is, it was assumed that at least some portion of the logrithmic region of the boundary was unaltered by the free-stream disturbances. Finally, it is observed that for the level of disturbances investigated, R_θ correlated C_f, whereas in studies with higher disturbance levels (e.g., Ref. 4) R_θ alone did not correlate C_f.

Typical disturbance levels of some porous wall wind tunnels at M = 0.5 fall in the ranges: $137 \leq \tilde{p}_{rms} \leq 144$ db and 1 percent $\leq \tilde{u}_{rms} \leq$ 2 percent.* Thus, the disturbances utilized in this investigation (i.e.,

*Recent LV measurements made in Tunnel 4T of the PWT, by Mr. F. L. Crosswy, indicated vortical levels in this range at M = 0.8.

$\tilde{p}_{rms}$ = 149 db and $\tilde{u}_{rms}$ = 1 percent) are representative disturbance levels. Because a large majority of wind tunnel testing is done with tripped boundary layers, it is important to know the effect of free-stream disturbances on the turbulent boundary layer. In this regard, the results of the present investigation are useful as they indicate, at least for these particular measurements, that vortical disturbances are much more effective than acoustic disturbances in alternating the turbulent boundary at typical tunnel disturbance levels.

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10. Whitfield, D. L. and High, M. D. "Velocity-Temperature Relations in Turbulent Boundary Layers with Non-unity Prandtl Numbers." AIAA Journal, Vol. 15, No. 3, March 1977, pp. 431-434.

11. Fenter, F. W. and Stalmach, C. J., Jr. "The Measurement of Local Turbulent Skin Friction at Supersonic Speeds by Means of Surface Impact Pressure Probes." Defense Research Laboratory Rept. DRL-392, CM-878, University of Texas, Austin, Texas, October, 1957.

12. Whitfield, D. L. "Analytical, Numerical, and Experimental Results on Turbulent Boundary Layers." AEDC-TR-76-62 (ADA027588), July 1976.

13. Braslow, A. L. "Review of the Effect of Distributed Surface Roughness on Boundary Layer Transition." AGARD Report. No. 254, 1960.

14. Braslow, A. L., Hicks, R. M., and Harris, R. V., Jr. "Use of Grit Type Boundary-Layer-Transition Trips in Wind Tunnel Models." NASA TN D-3579, 1966.

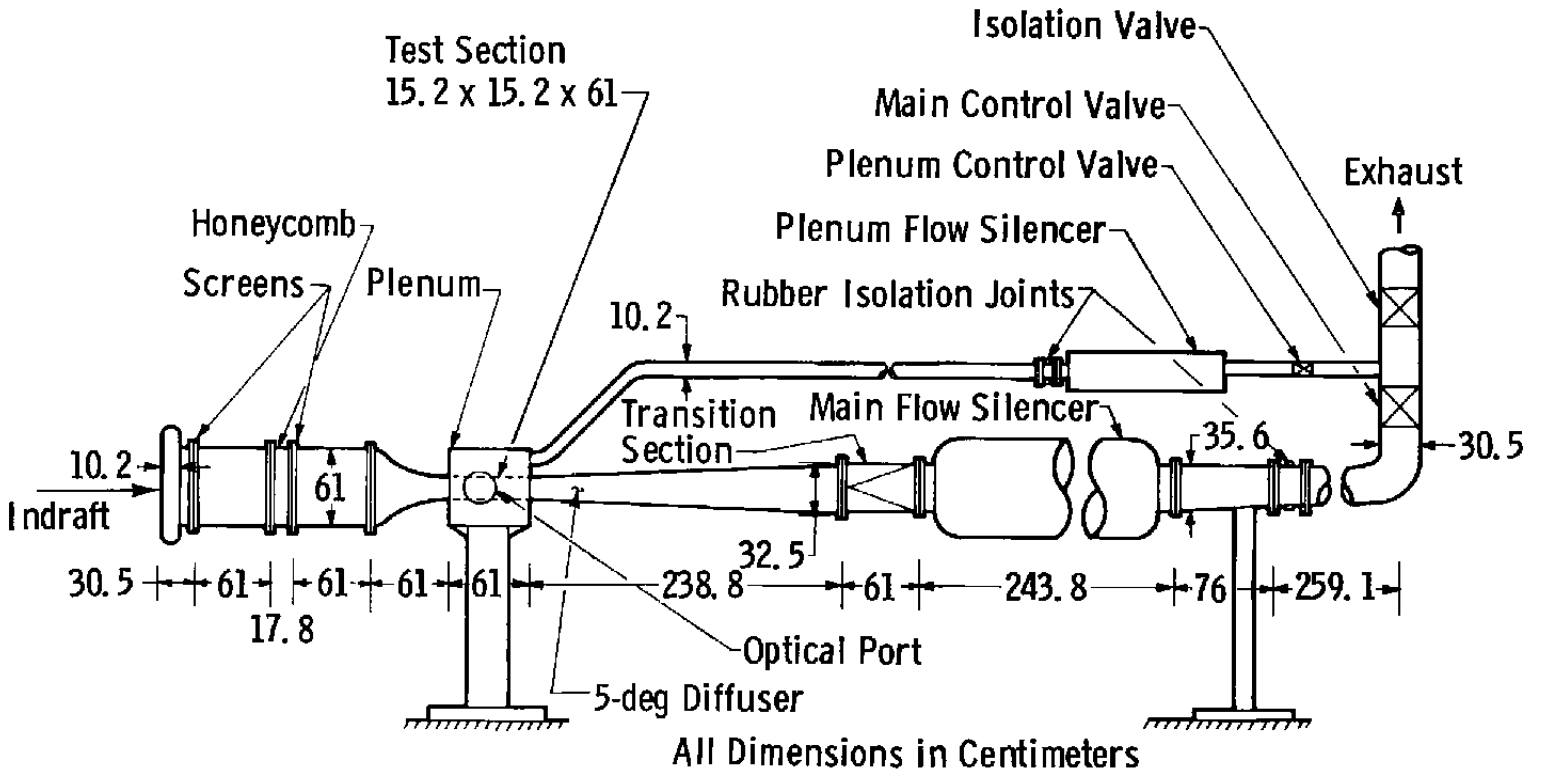
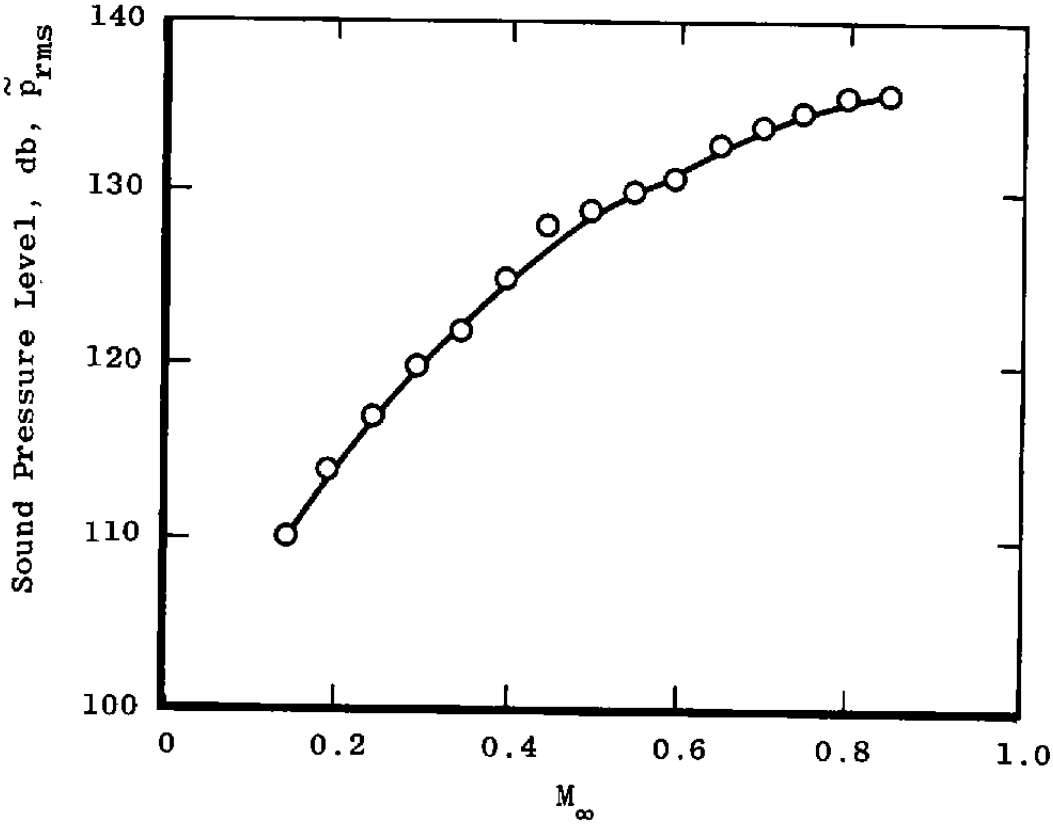
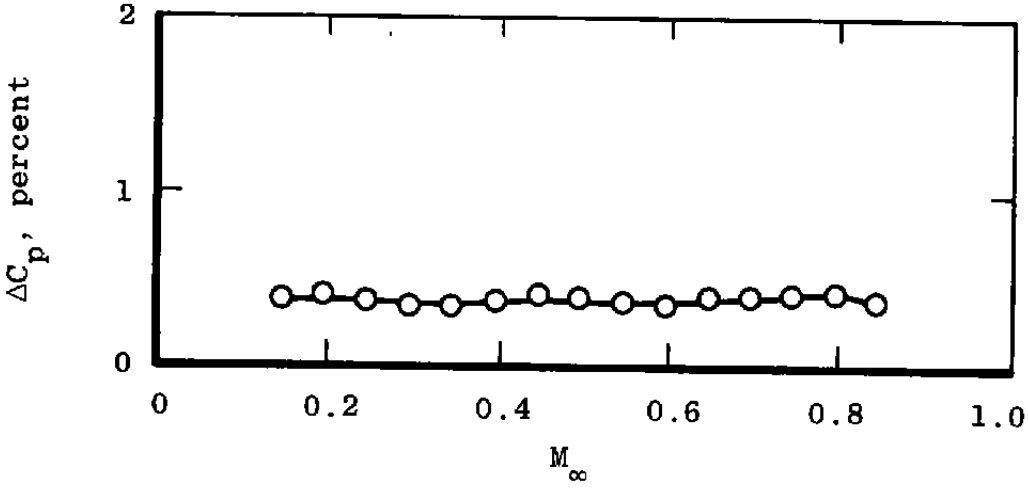


Figure 1. Schematic of the Acoustic Research Tunnel (ART).



a. Sound pressure level calibration



b. Acoustic parameter, ΔC_p calibration

Figure 2. Background acoustic level calibration of the ART with solid test section walls.

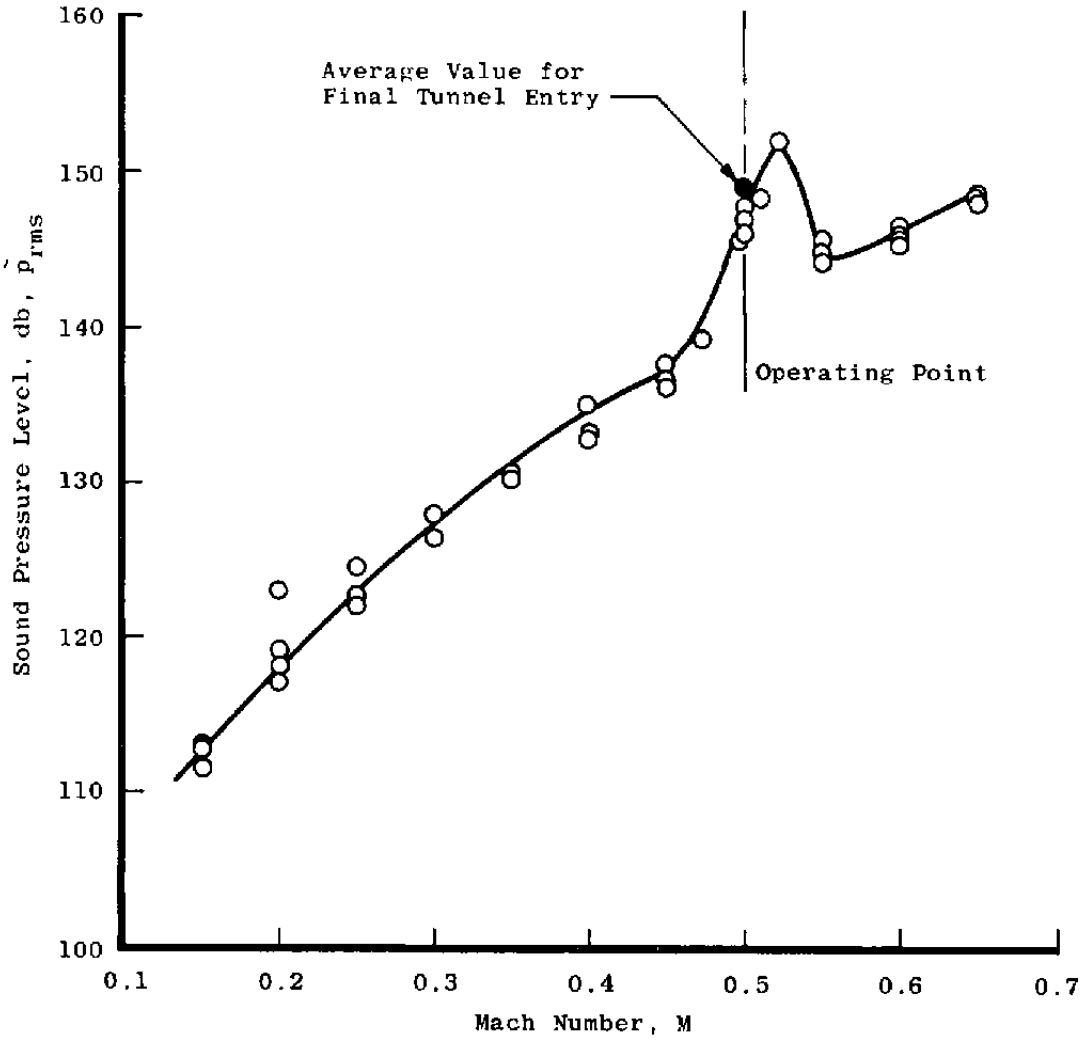


Figure 3. Calibration of the tunnel 4T wall at zero porosity as an acoustic generator in terms of sound pressure level.

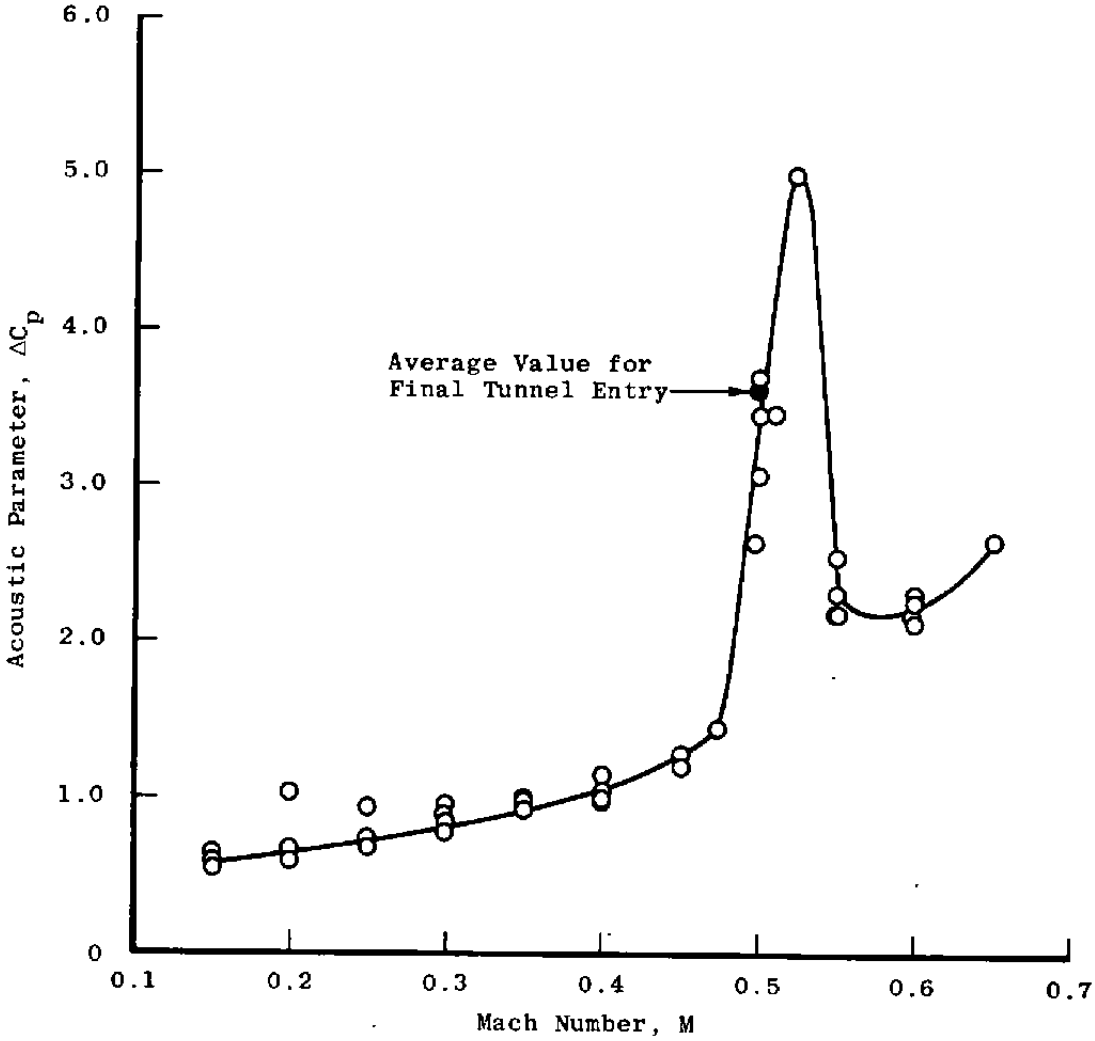


Figure 4. Acoustic properties of the tunnel 4T wall at zero porosity in the ART in terms of the acoustic parameter, ΔC_p.

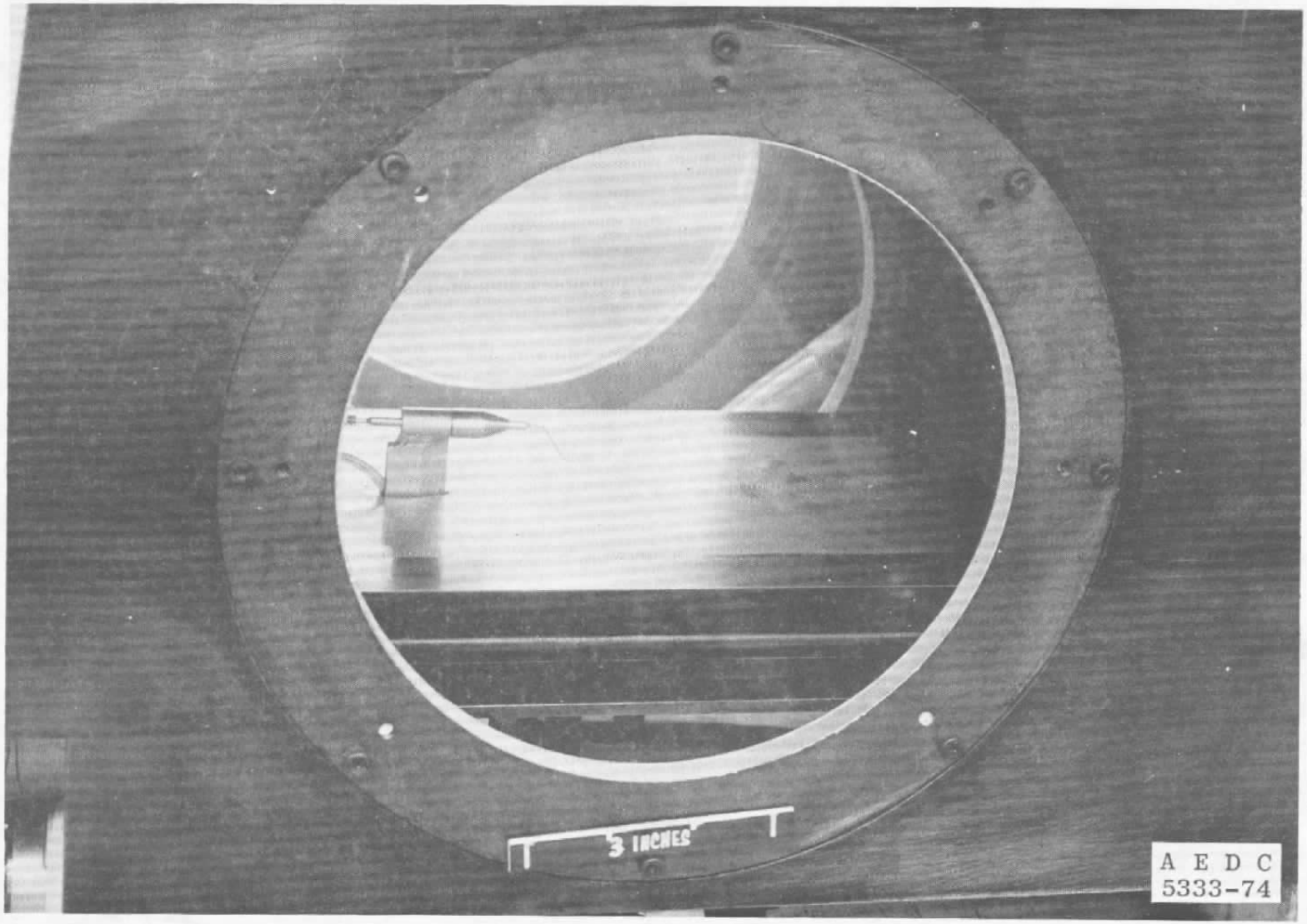


Figure 5. Installation of the pitot probe and traversing mechanism in the ART.

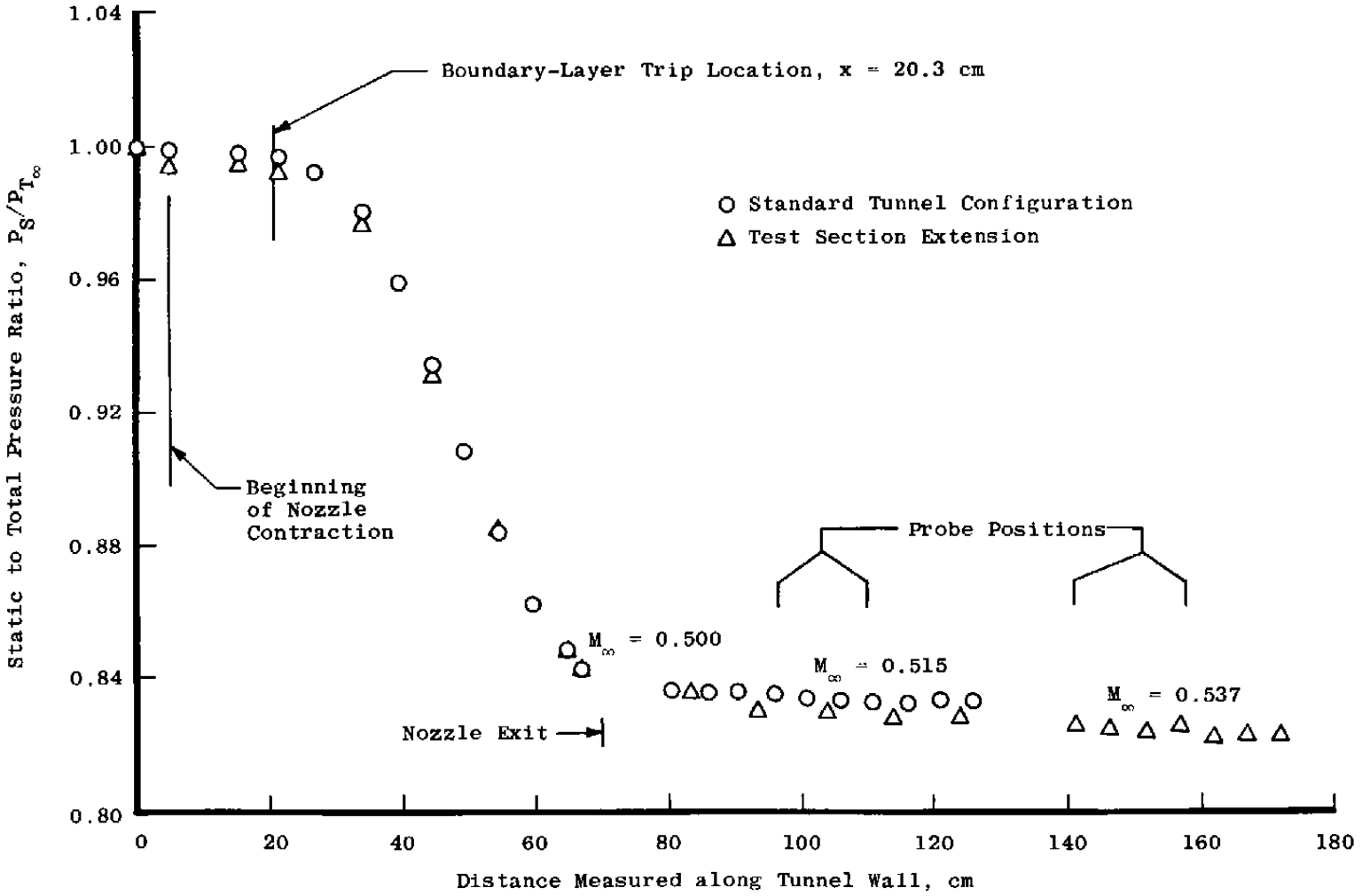


Figure 6. Static pressure gradient in the ART at M = 0.5.

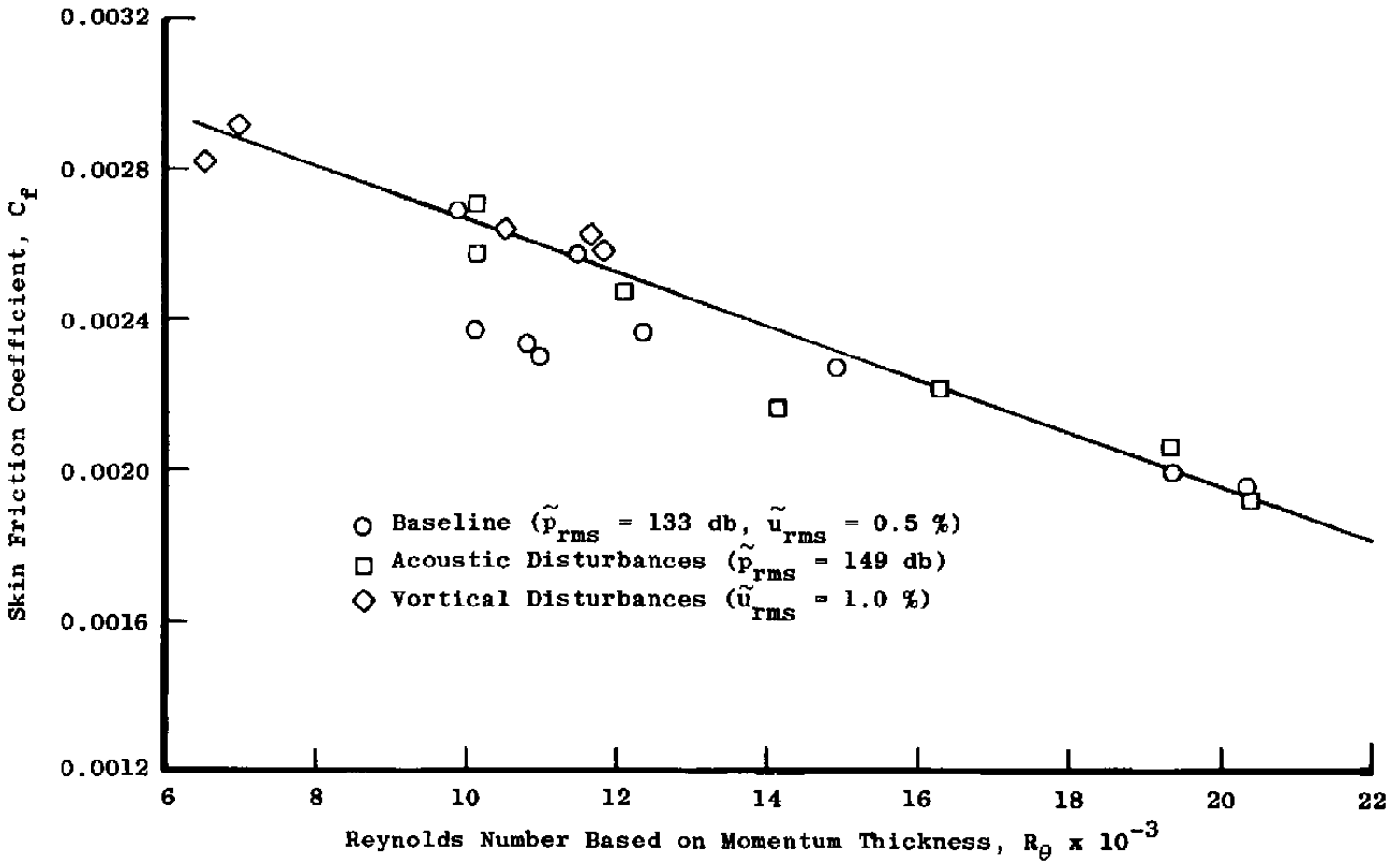


Figure 7. Consistency check of the boundary-layer data.

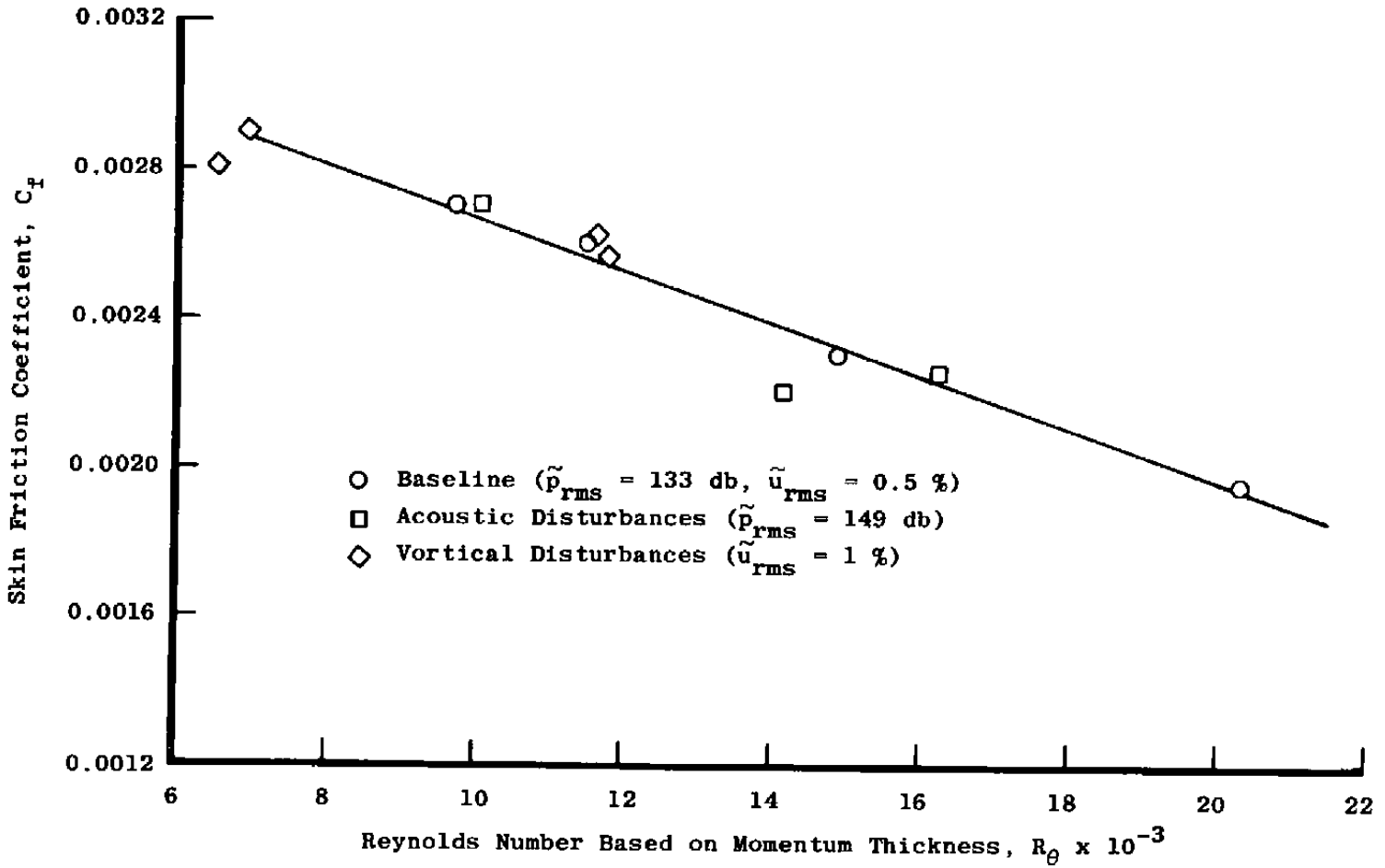
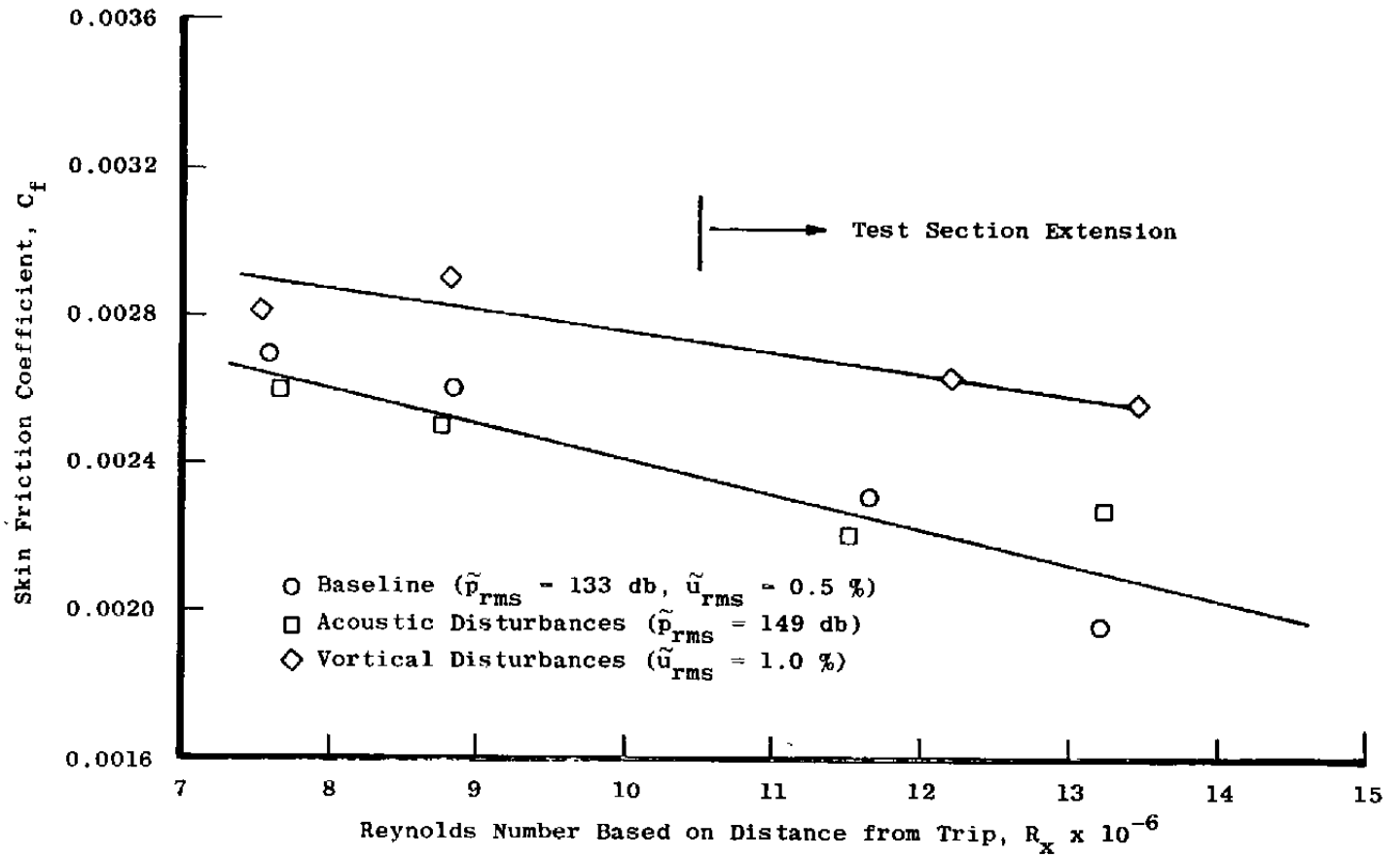
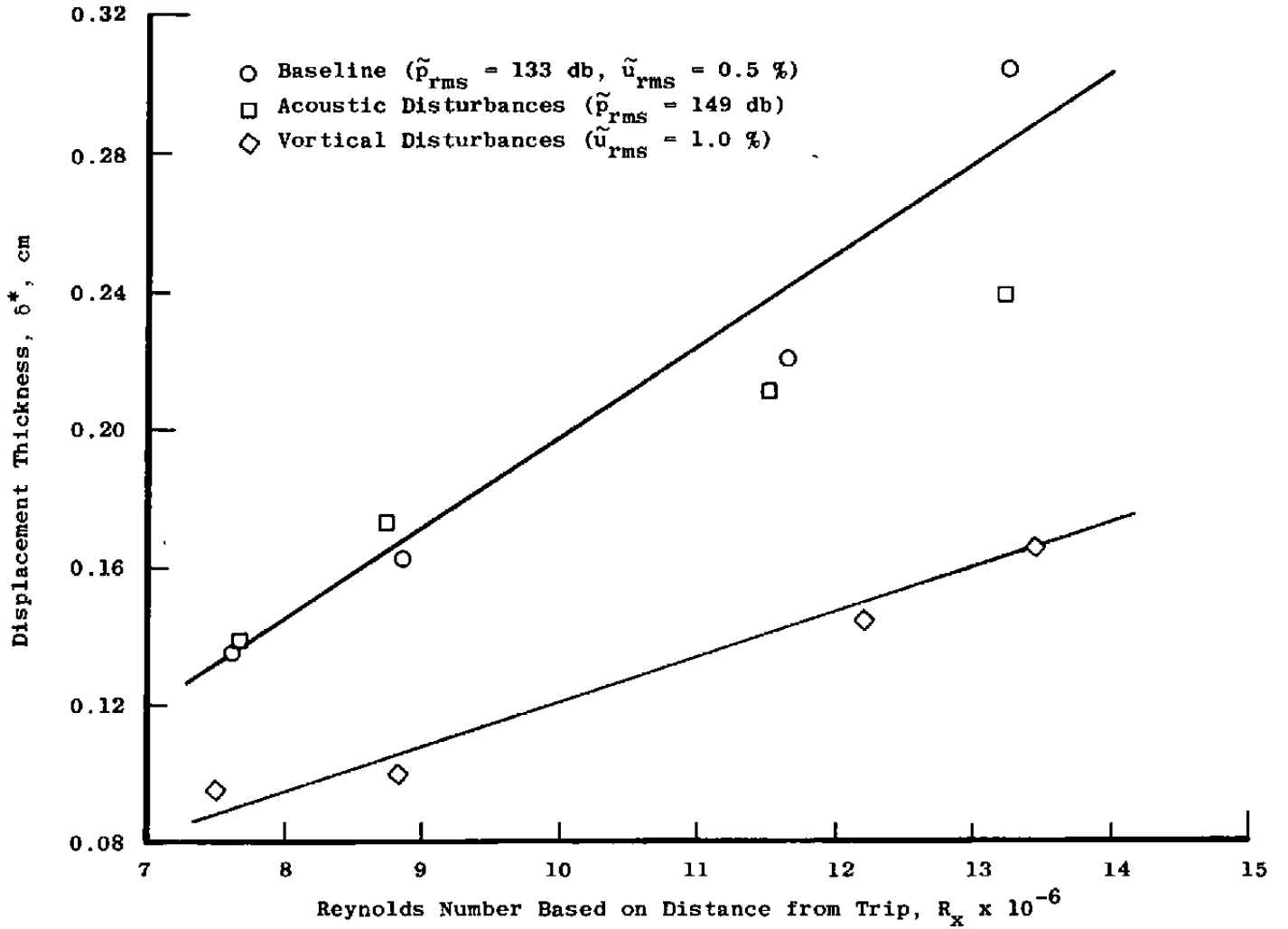


Figure 8. Consistency check of the data from final tunnel entry.



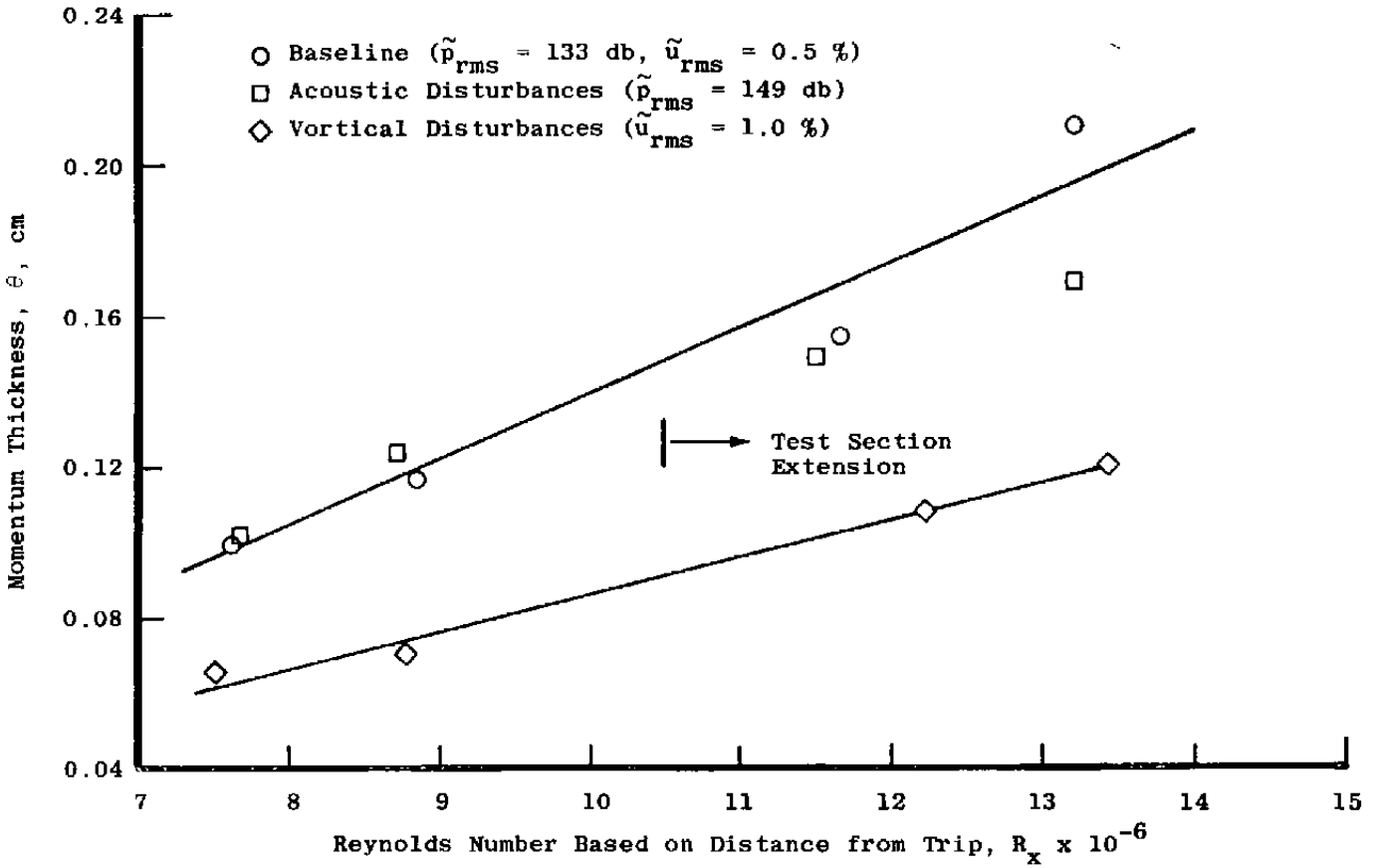
a. Skin friction coefficient

Figure 9. Integral boundary-layer parameters.



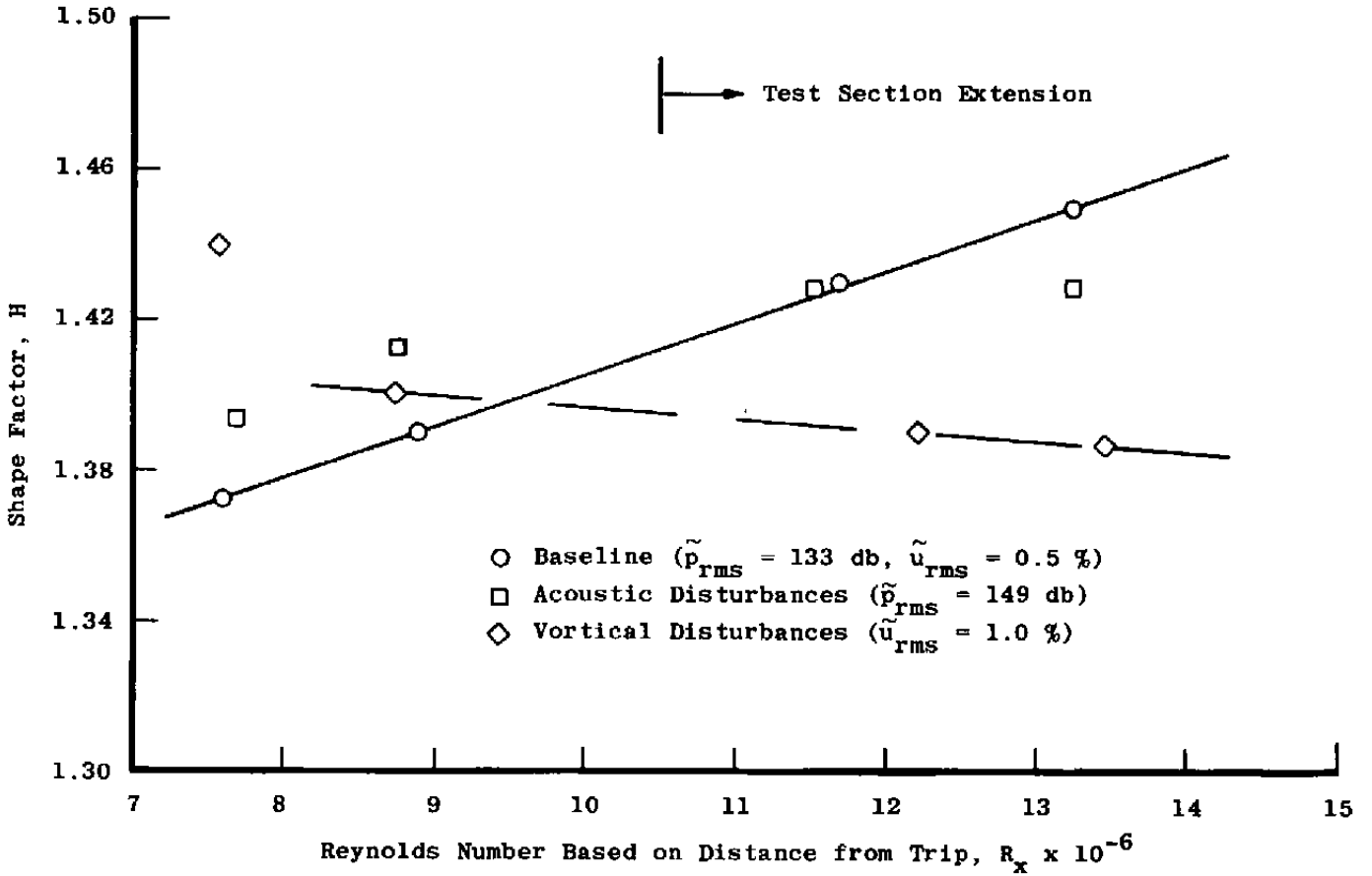
b. Displacement thickness

Figure 9. Continued.



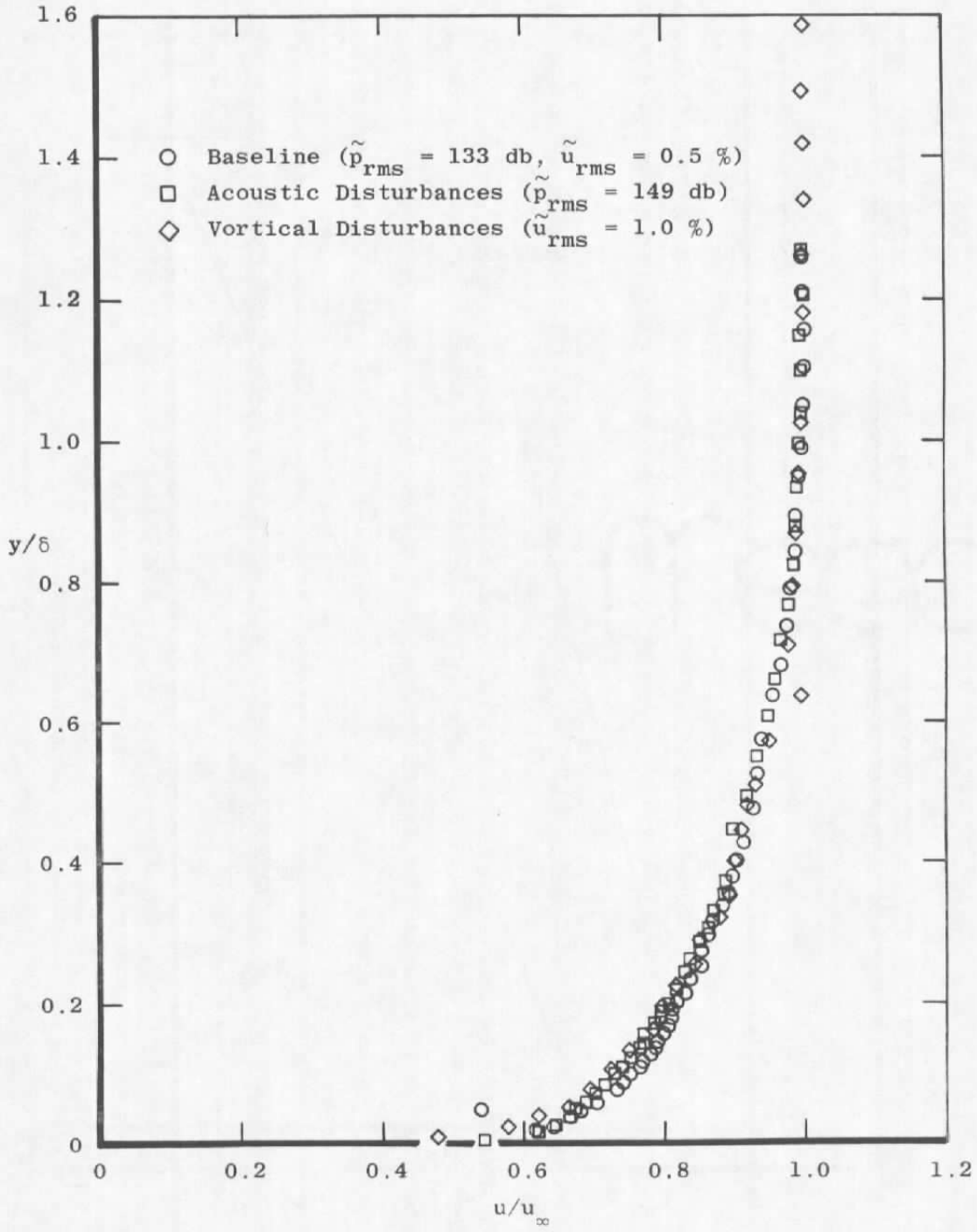
c. Momentum thickness

Figure 9. Continued.



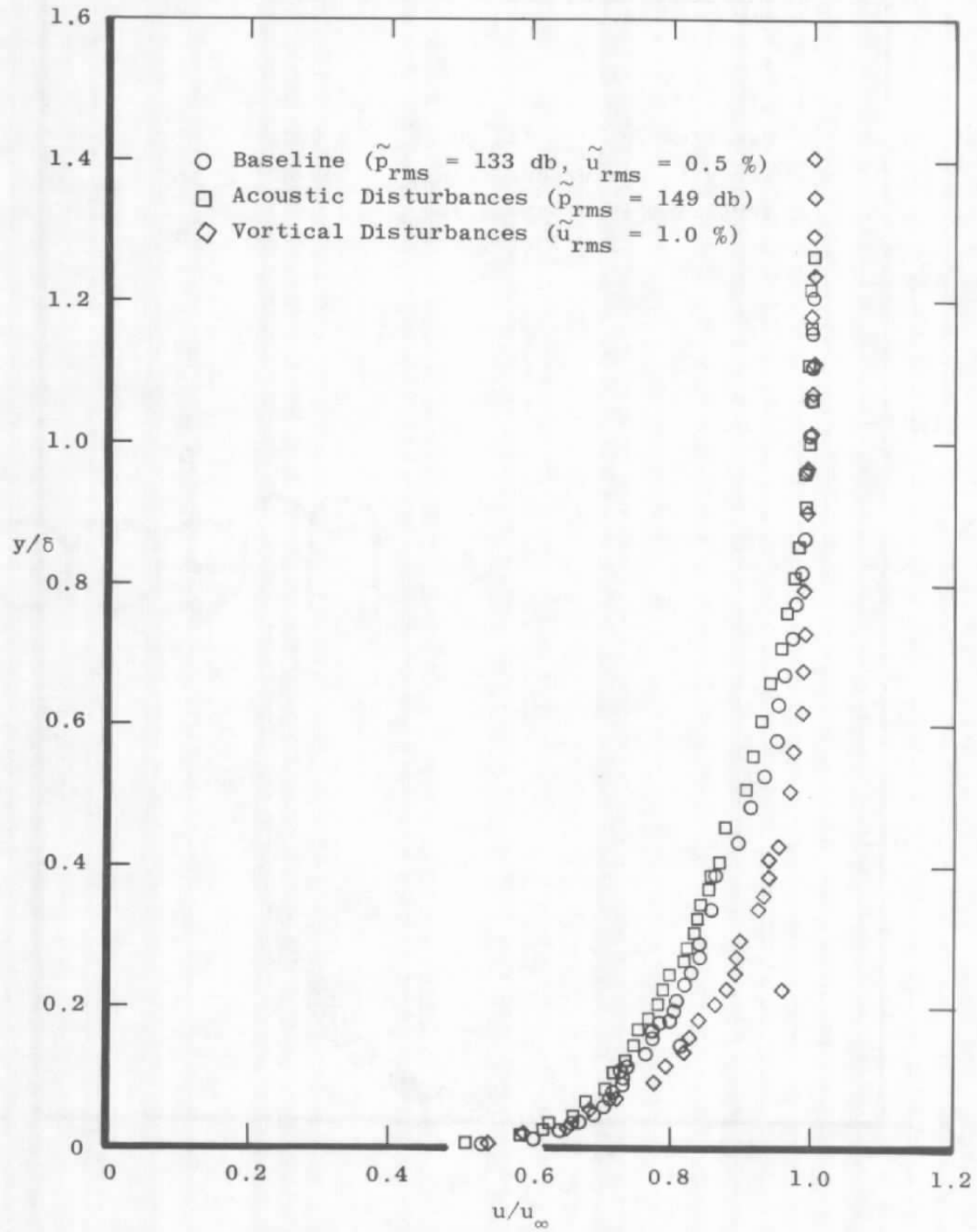
d. Shape factor

Figure 9. Concluded.

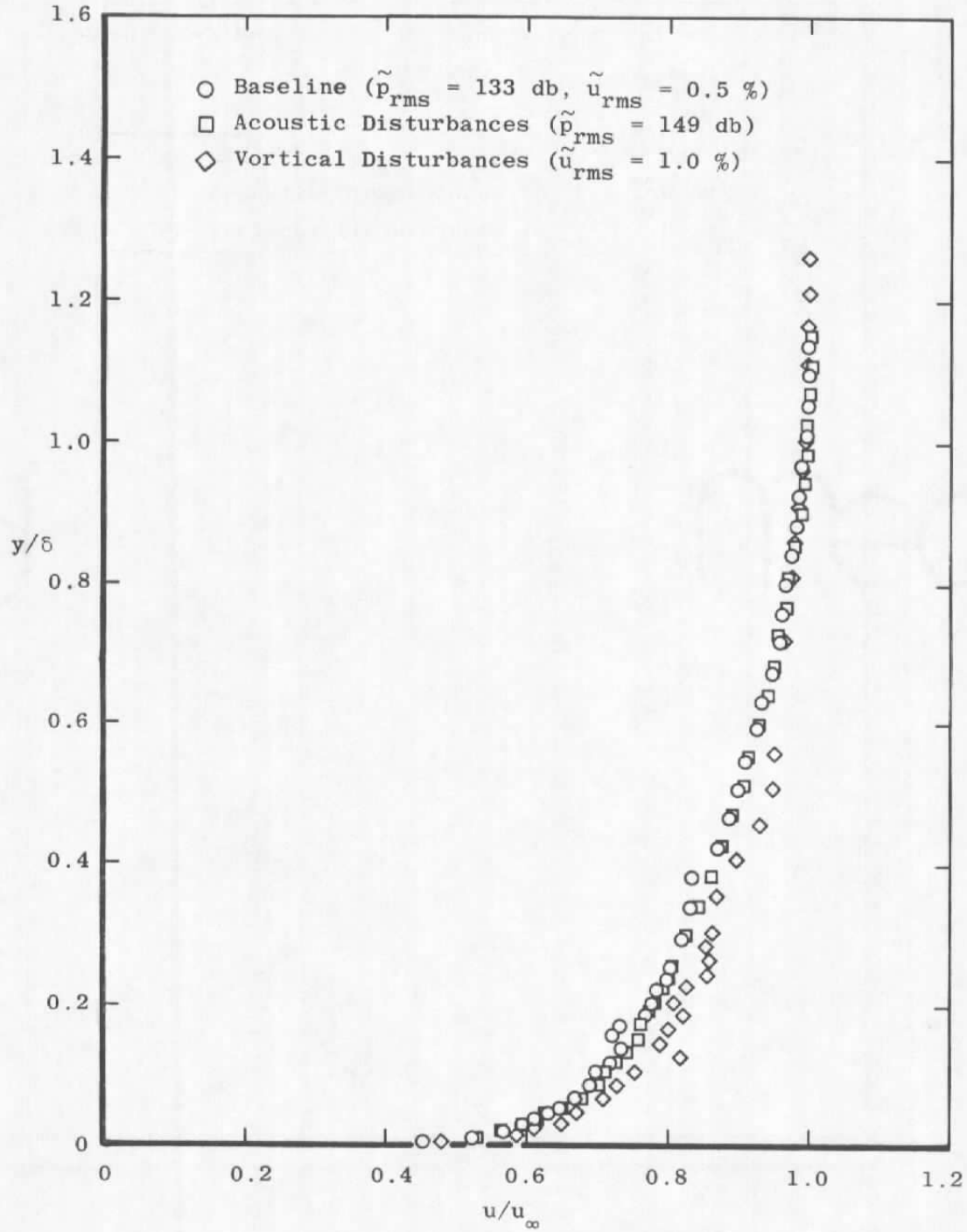


a. Distance from trip, x = 76.2 cm

Figure 10. Dimensionless velocity profiles.

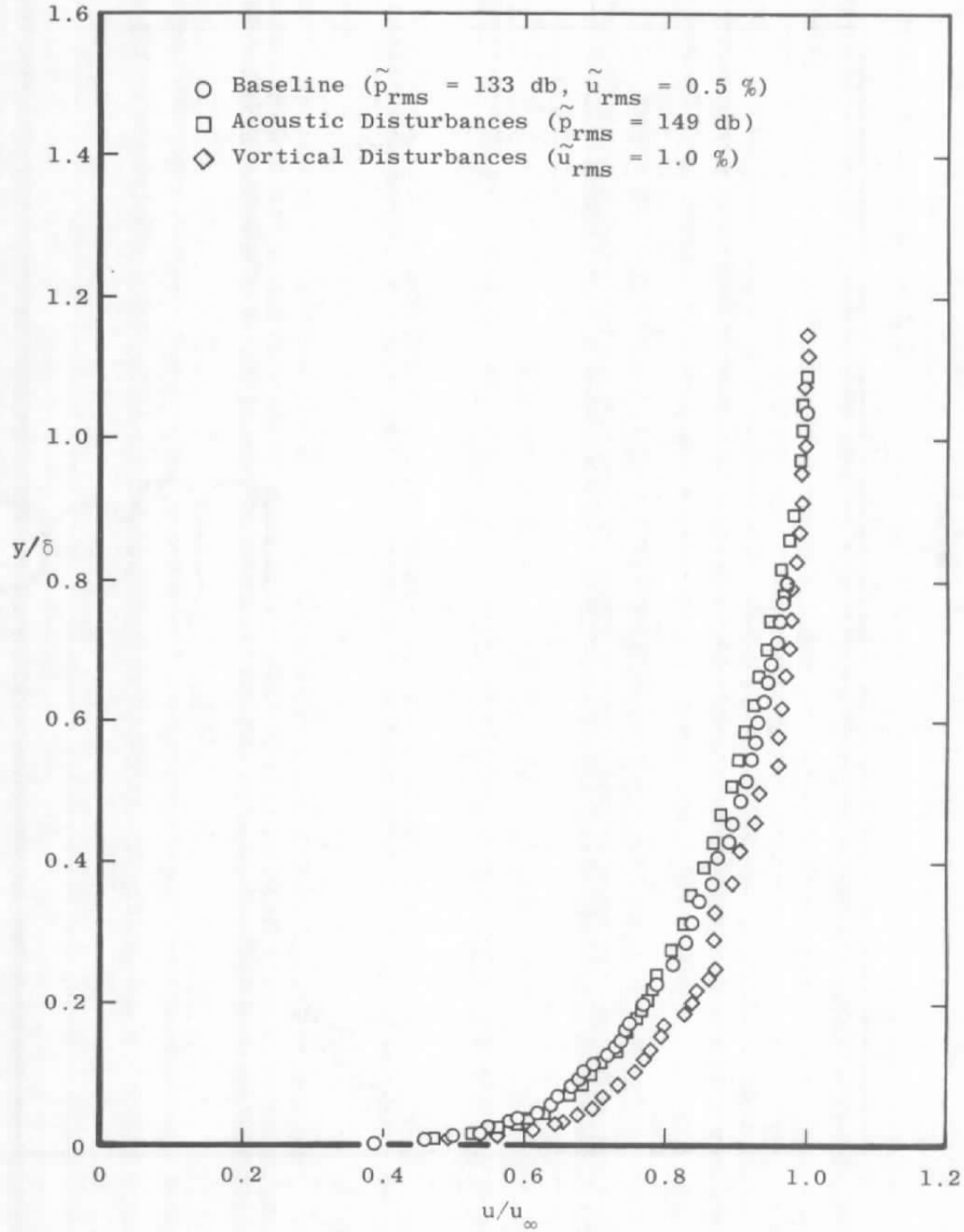


b. Distance from trip, x = 89.7 cm
Figure 10. Continued.



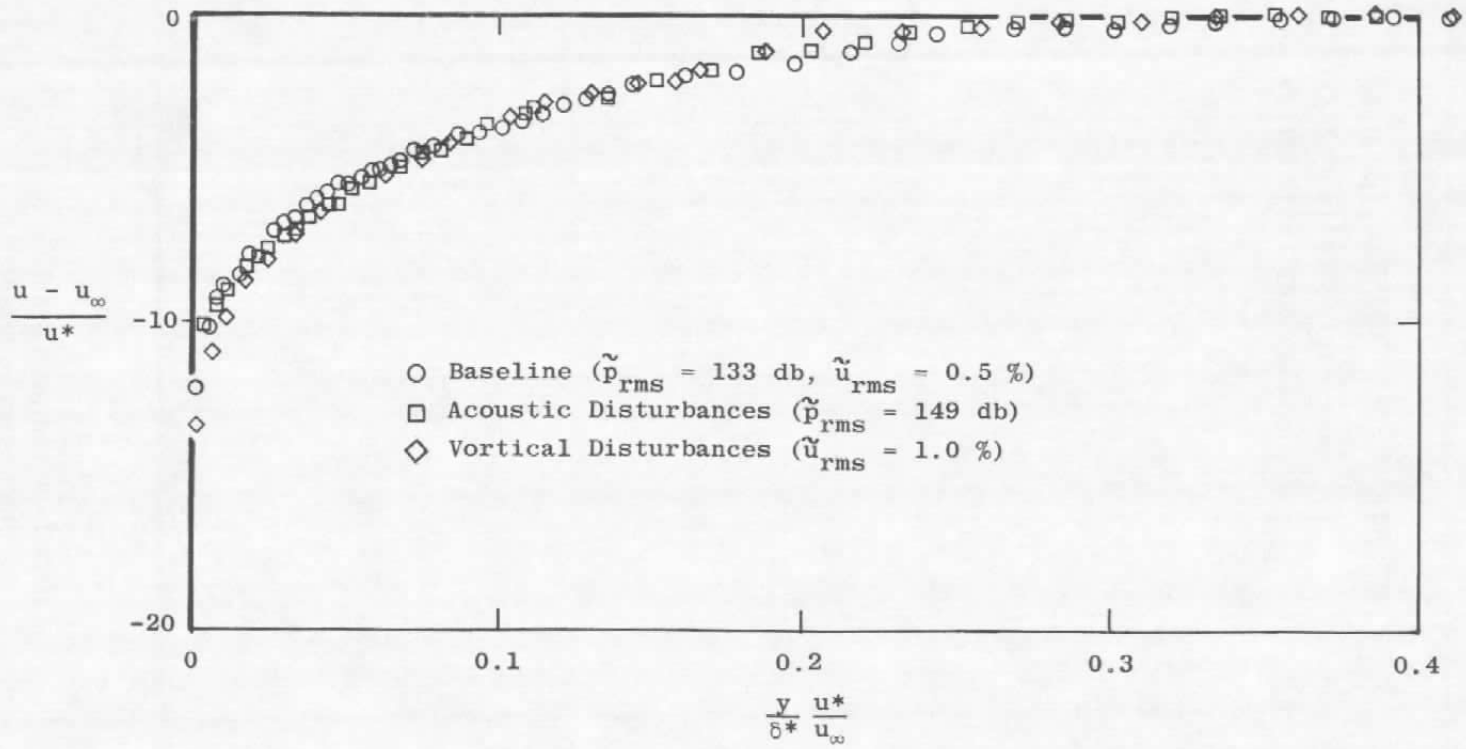
c. Distance from trip, x = 120.9 cm (test section extension)

Figure 10. Continued.



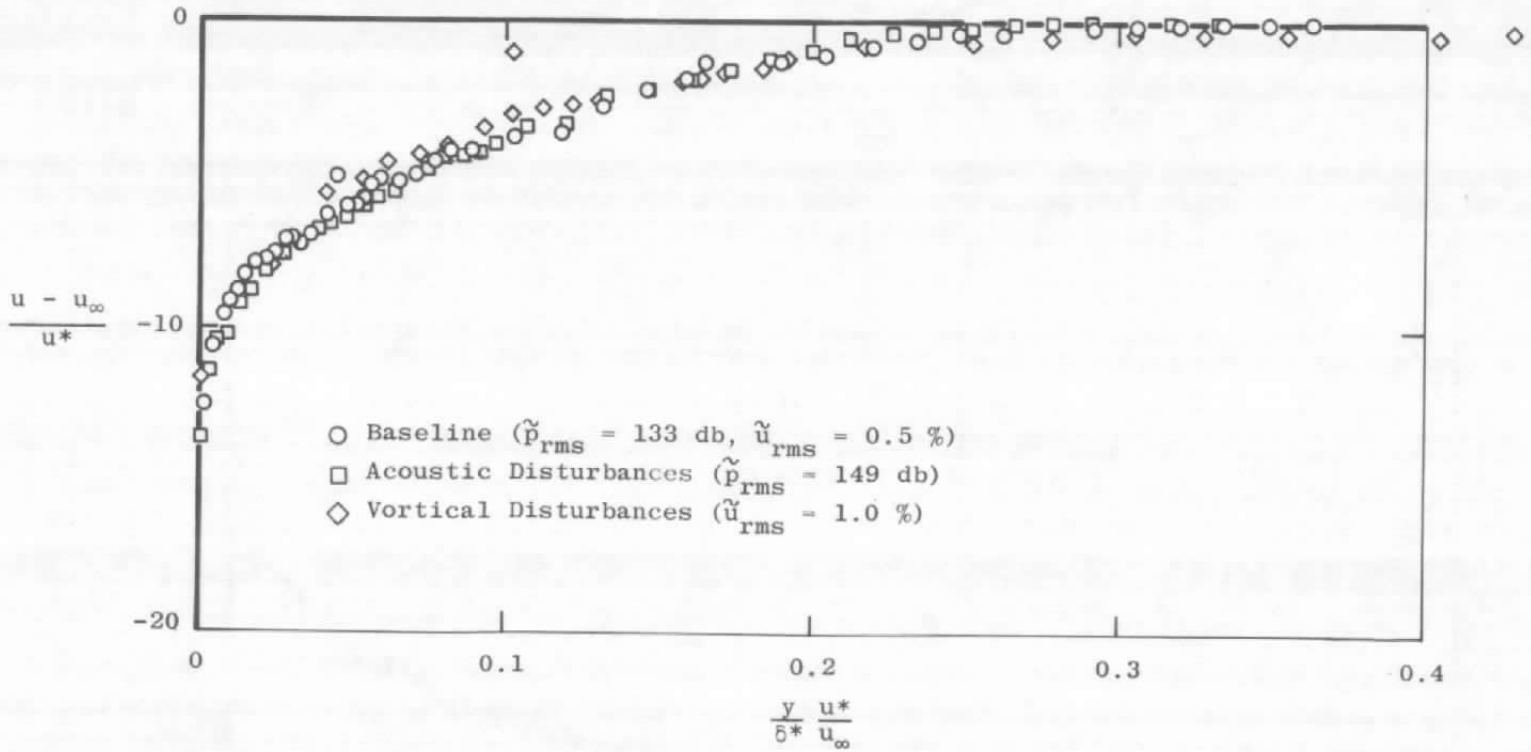
d. Distance from trip, x = 137.2 cm (test section extension)

Figure 10. Concluded.

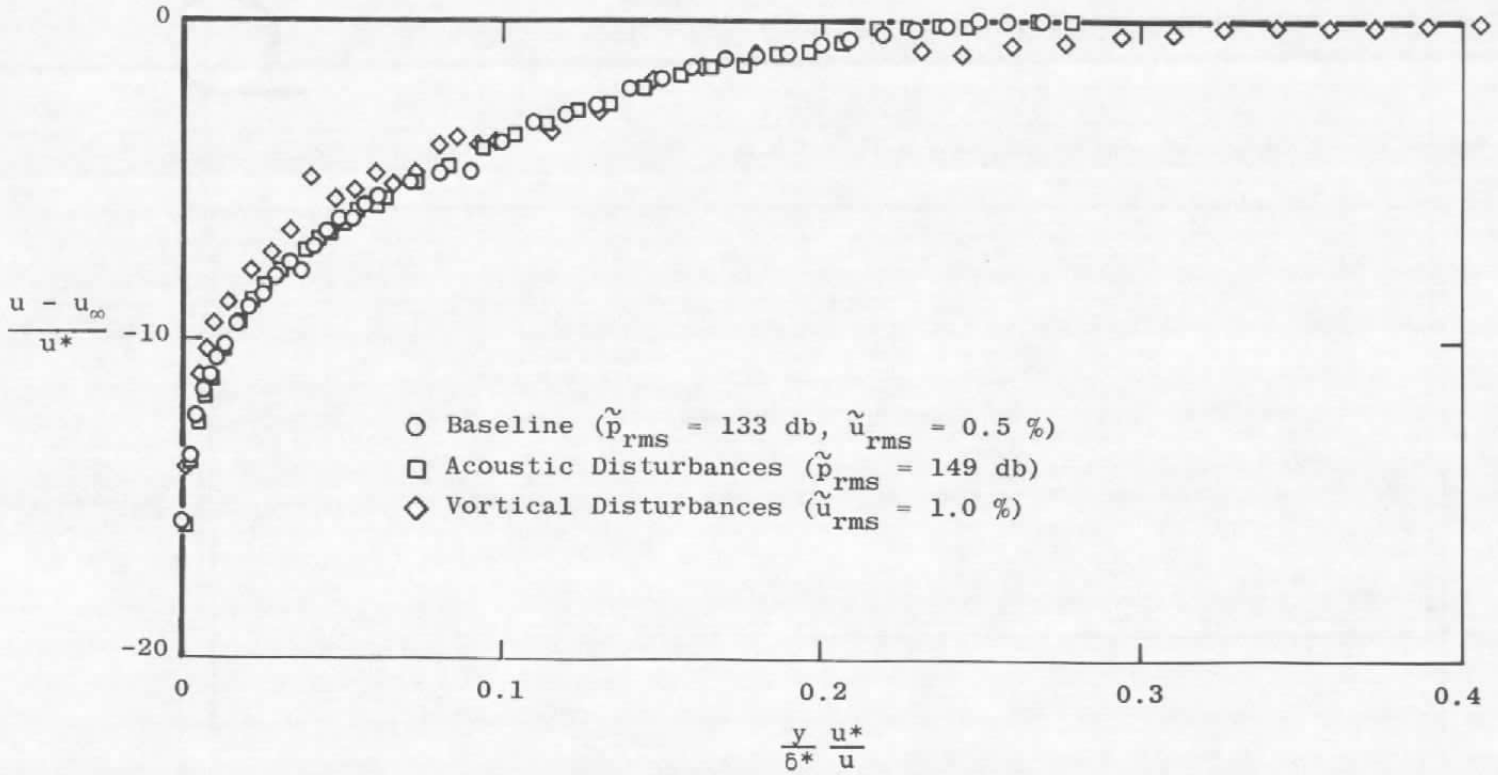


a. Distance from trip, x = 76.2 cm

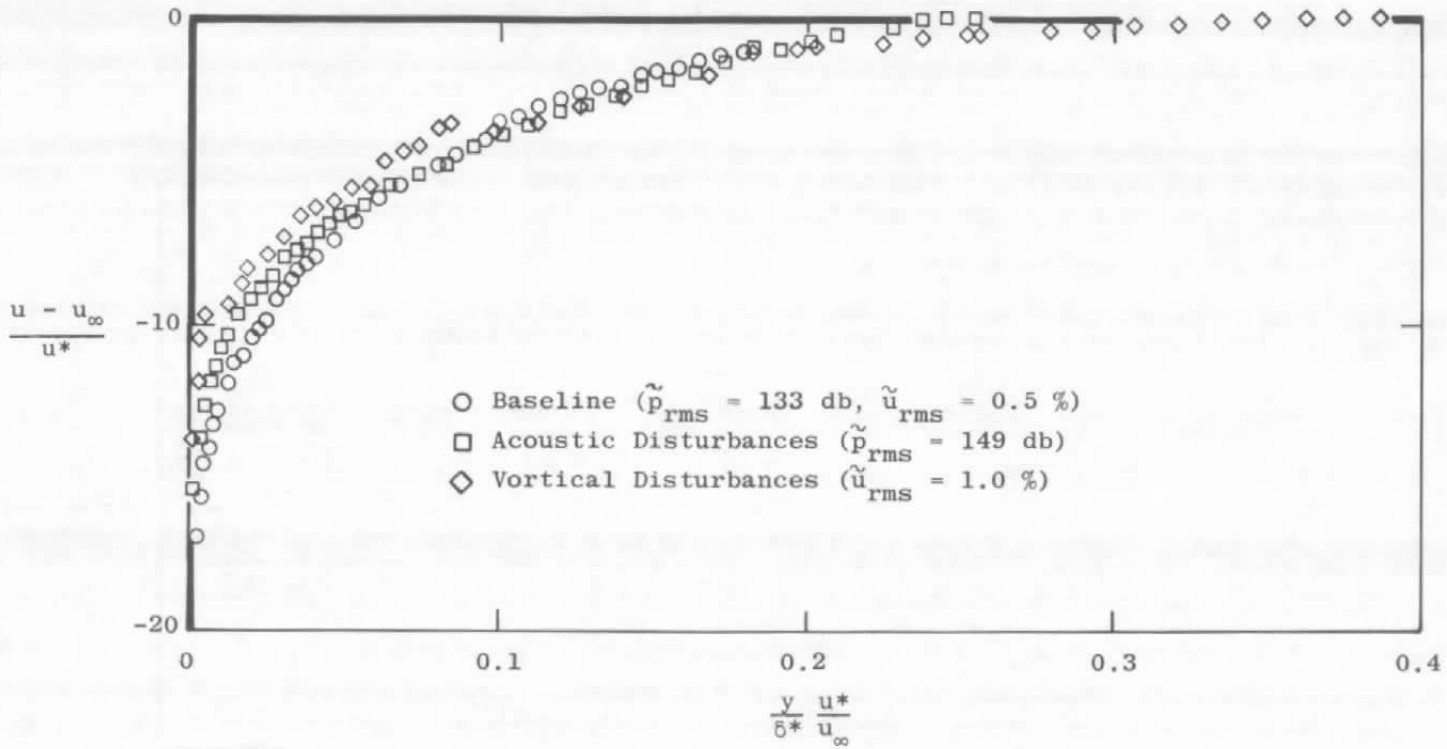
Figure 11. Boundary-layer profiles in velocity defect coordinates.



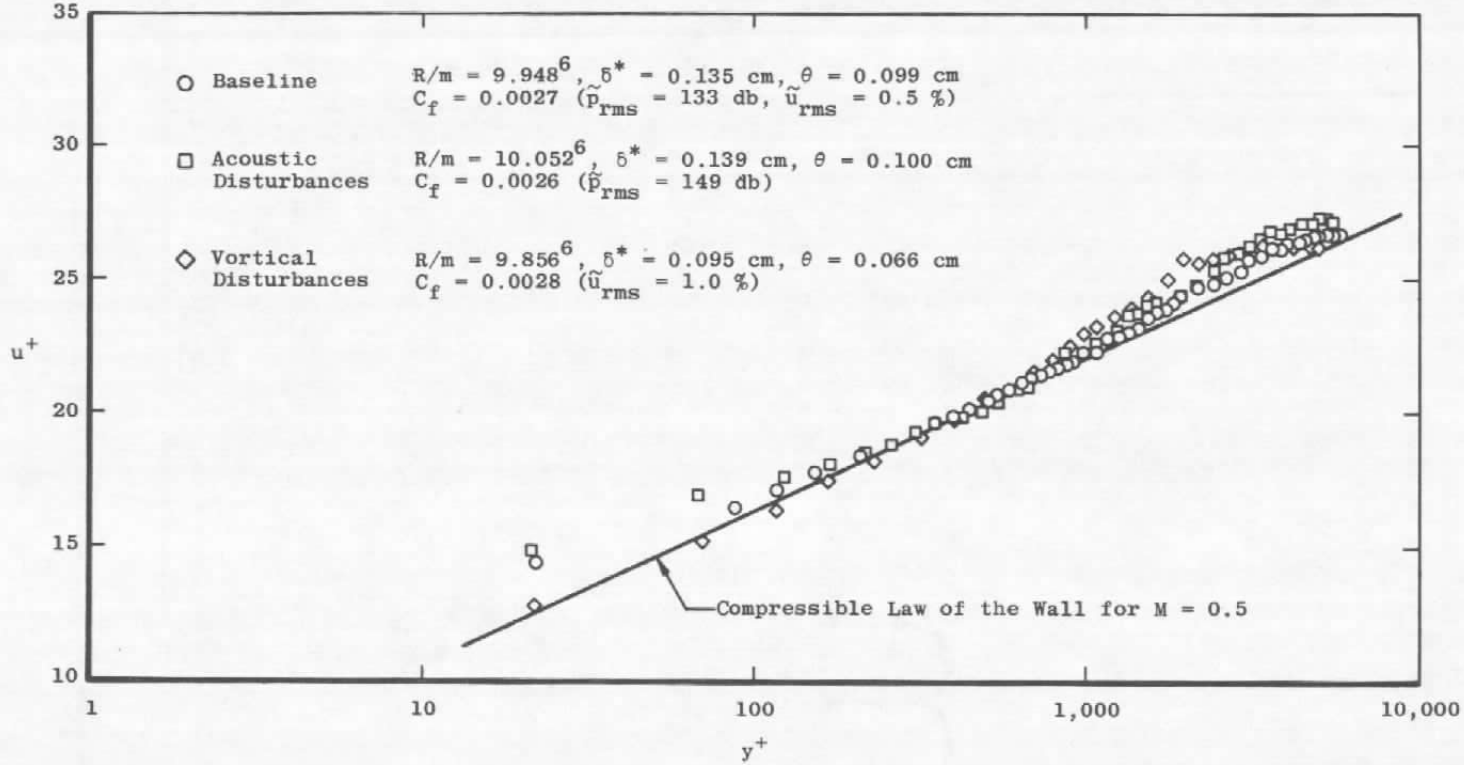
b. Distance from trip, x = 89.7 cm
Figure 11. Continued.



c. Distance from trip, x = 120.9 cm (test section extension)
Figure 11. Continued.

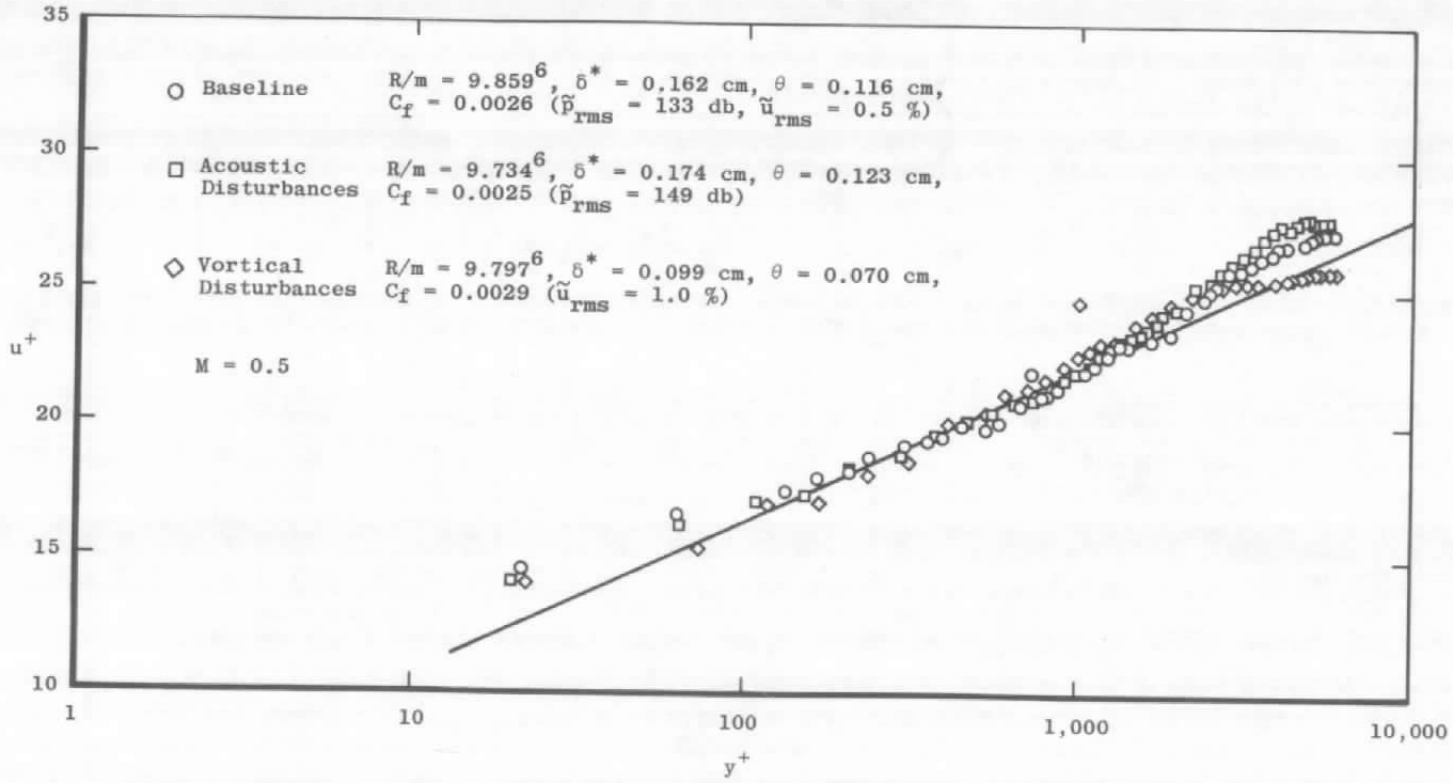


d. Distance from trip, x = 137.2 cm (test section extension)
Figure 11. Concluded.



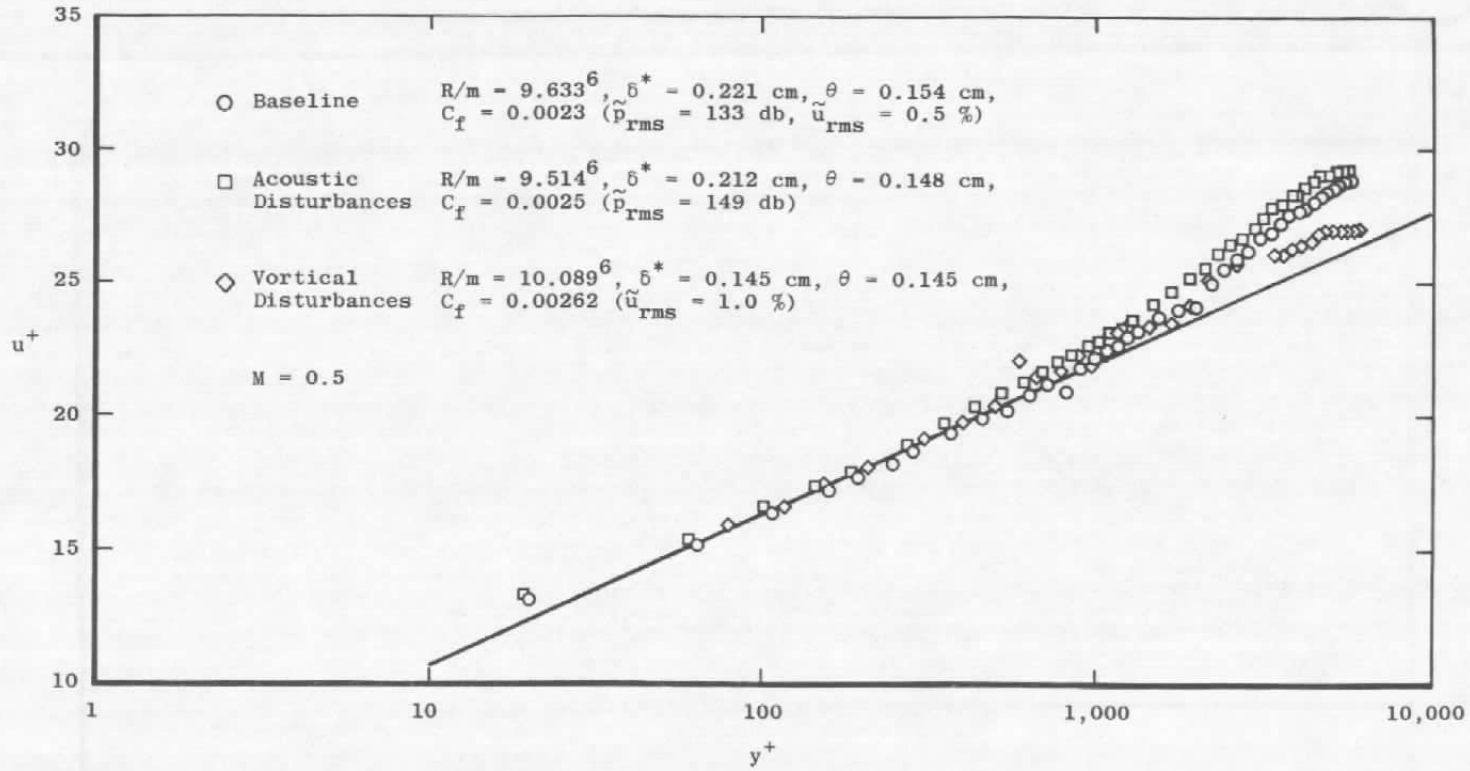
a. Distance from trip, x = 76.2 cm

Figure 12. Boundary-layer profiles in law of the wall coordinates.

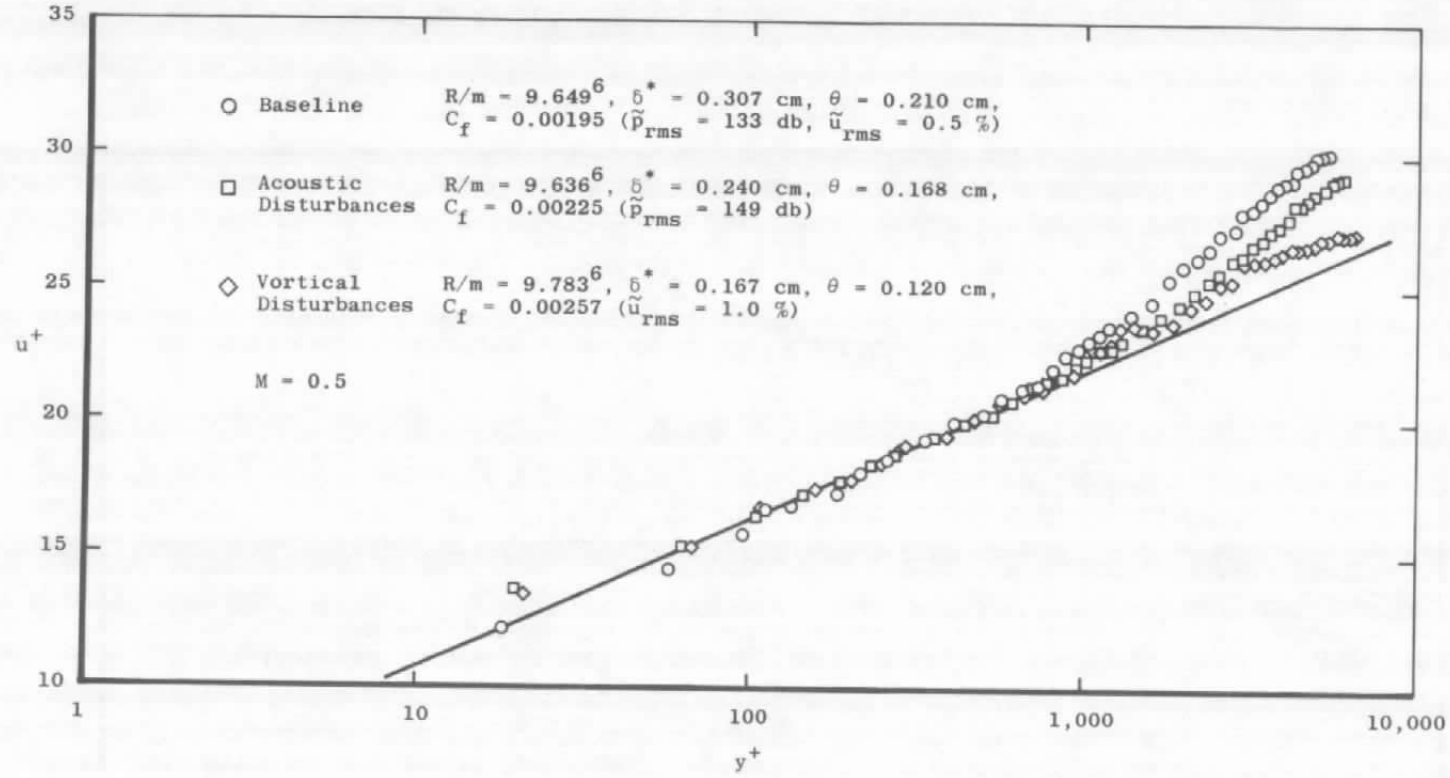


b. Distance from trip, x = 89.7 cm

Figure 12. Continued.



c. Distance from trip, x = 120.9 cm (test section extension)
Figure 12. Continued.



d. Distance from trip, x = 137.2 cm (test section extension)

Figure 12. Concluded.

Table 1. Boundary-Layer Profiles

Index to Boundary-Layer Profiles

I. Probe Position x = 76.2 cm

Run No. 76-25	Baseline
Run No. 76-26	Acoustic Disturbance
Run No. 76-30	Vortical Disturbance

II. Probe Position x = 89.7 cm

Run No. 76-24	Baseline
Run No. 76-28	Acoustic Disturbance
Run No. 76-29	Vortical Disturbance

III.* Probe Position x = 120.9 cm

Run No. 76-33	Baseline
Run No. 76-34	Acoustic Disturbance
Run No. 76-32	Vortical Disturbance

IV.* Probe Position x = 137.2 cm

Run No. 76-36	Baseline
Run No. 76-35	Acoustic Disturbance
Run No. 76-31	Vortical Disturbance

*These data were obtained with the test section extension installed.

RUN NUMBER 76- 25

THIS DATA REDUCTION SHOT IS FOR AN ADIABATIC WALL

RECOVERY FACTOR = 0.8800

PRANDTL NUMBER = 0.8090

GAMMA = 1.4000

FREE-STREAM UNIT REYNOLDS NO. PER METER= 9.9475E 06

DELTA(CM) = 1.2164E 00

DELTA STAR(CM) = 1.5247E-01 DELTA STAR(CM) NEW = 1.3516E-01

THETA(CM) = 9.2473E-02 THETA(CM) NEW = 9.8513E-02

SHAPE FACTOR = 1.6488E 00 NEW SHAPE FACTOR = 1.3720E 00

SKIN FRICTION = 2.7000E-03

Y	PT2	TO/TOE	M	U/UE	T/TE	TBAR	RHO/RHOE	RHO*U/(RHOE*UE)
0.0	8.43002E-01	9.94284E-01	0.0	0.0	1.04400E 00	0.0	9.57850E-01	0.0
5.84200E-02	8.85700E-01	9.96967E-01	2.66612E-01	5.41690E-01	1.03215E 00	4.69410E-01	9.68853E-01	5.24818E-01
2.36220E-02	8.98900E-01	9.97770E-01	3.04243E-01	6.17090E-01	1.02862E 00	6.09884E-01	9.72174E-01	5.99918E-01
3.12420E-02	9.04400E-01	9.98101E-01	3.18508E-01	6.45567E-01	1.02717E 00	6.67726E-01	9.73548E-01	6.28490E-01
4.14020E-02	9.09000E-01	9.98376E-01	3.29921E-01	6.68307E-01	1.02597E 00	7.15875E-01	9.74691E-01	6.51392E-01
5.66420E-02	9.12500E-01	9.98584E-01	3.38319E-01	6.85015E-01	1.02505E 00	7.52264E-01	9.75558E-01	6.68272E-01
6.93420E-02	9.17100E-01	9.98855E-01	3.49017E-01	7.06264E-01	1.02386E 00	7.99619E-01	9.76696E-01	6.89805E-01
9.47419E-02	9.23200E-01	9.99211E-01	3.62659E-01	7.33305E-01	1.02229E 00	8.61910E-01	9.78199E-01	7.17318E-01
1.07442E-01	9.25700E-01	9.99354E-01	3.68088E-01	7.44049E-01	1.02164E 00	8.87017E-01	9.78814E-01	7.28285E-01
1.20142E-01	9.27700E-01	9.99470E-01	3.72370E-01	7.52516E-01	1.02113E 00	9.07198E-01	9.79306E-01	7.36944E-01
1.35382E-01	9.31200E-01	9.99668E-01	3.79718E-01	7.67029E-01	1.02024E 00	9.41840E-01	9.80164E-01	7.51815E-01
1.45542E-01	9.32800E-01	9.99757E-01	3.83032E-01	7.73567E-01	1.01983E 00	9.57413E-01	9.80559E-01	7.58528E-01
1.58242E-01	9.34800E-01	9.99869E-01	3.87118E-01	7.81625E-01	1.01932E 00	9.77117E-01	9.81048E-01	7.66812E-01
1.70942E-01	9.37300E-01	1.00000E 00	3.92166E-01	7.91569E-01	1.01868E 00	1.00095E 00	9.81664E-01	7.77055E-01
1.83642E-01	9.37800E-01	1.00003E 00	3.93168E-01	7.93541E-01	1.01855E 00	1.00572E 00	9.81787E-01	7.79089E-01
1.96342E-01	9.39800E-01	1.00014E 00	3.97138E-01	8.01354E-01	1.01804E 00	1.02463E 00	9.82278E-01	7.87152E-01
2.09042E-01	9.41400E-01	1.00023E 00	4.00284E-01	8.07538E-01	1.01763E 00	1.03941E 00	9.82673E-01	7.93546E-01
2.21742E-01	9.41900E-01	1.00025E 00	4.01259E-01	8.09456E-01	1.01750E 00	1.04402E 00	9.82796E-01	7.95530E-01
2.34442E-01	9.43400E-01	1.00033E 00	4.04172E-01	8.15179E-01	1.01712E 00	1.05768E 00	9.83166E-01	8.01456E-01
2.44602E-01	9.44900E-01	1.00041E 00	4.07064E-01	8.20856E-01	1.01674E 00	1.07103E 00	9.83538E-01	8.07343E-01
2.62382E-01	9.48400E-01	1.00058E 00	4.13716E-01	8.33902E-01	1.01584E 00	1.10154E 00	9.84406E-01	8.20898E-01
2.85242E-01	9.49900E-01	1.00065E 00	4.16524E-01	8.39403E-01	1.01546E 00	1.11409E 00	9.84779E-01	8.26627E-01
3.10642E-01	9.54000E-01	1.00084E 00	4.24103E-01	8.54230E-01	1.01440E 00	1.14651E 00	9.85809E-01	8.42107E-01
3.36042E-01	9.54500E-01	1.00086E 00	4.25018E-01	8.56019E-01	1.01427E 00	1.15048E 00	9.85935E-01	8.43979E-01
3.61442E-01	9.56500E-01	1.00094E 00	4.28649E-01	8.63109E-01	1.01374E 00	1.16510E 00	9.86442E-01	8.51407E-01
3.86842E-01	9.58500E-01	1.00102E 00	4.32244E-01	8.70122E-01	1.01322E 00	1.17893E 00	9.86953E-01	8.58769E-01
4.12242E-01	9.62600E-01	1.00117E 00	4.39502E-01	8.84259E-01	1.01213E 00	1.20435E 00	9.88014E-01	8.73660E-01
4.37642E-01	9.64600E-01	1.00123E 00	4.42993E-01	8.91045E-01	1.01159E 00	1.21484E 00	9.88541E-01	8.80834E-01
4.63042E-01	9.66600E-01	1.00128E 00	4.46451E-01	8.97758E-01	1.01105E 00	1.22422E 00	9.89072E-01	8.87948E-01
4.88442E-01	9.68700E-01	1.00133E 00	4.50051E-01	9.04740E-01	1.01047E 00	1.23248E 00	9.89640E-01	8.95367E-01
5.13842E-01	9.72200E-01	1.00138E 00	4.55967E-01	9.16185E-01	1.00948E 00	1.24217E 00	9.90605E-01	9.07578E-01
5.79882E-01	9.76200E-01	1.00141E 00	4.62627E-01	9.29032E-01	1.00832E 00	1.24599E 00	9.91747E-01	9.21365E-01
6.40842E-01	9.77200E-01	1.00140E 00	4.64273E-01	9.32200E-01	1.00803E 00	1.24567E 00	9.92039E-01	9.24778E-01
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8.31342E-01	9.88900E-01	1.00107E 00	4.83024E-01	9.68038E-01	1.00426E 00	1.18640E 00	9.95754E-01	9.63928E-01
8.97382E-01	9.91400E-01	1.00090E 00	4.86917E-01	9.75409E-01	1.00338E 00	1.15779E 00	9.96635E-01	9.72127E-01
9.60882E-01	9.93400E-01	1.00074E 00	4.90007E-01	9.81237E-01	1.00264E 00	1.12967E 00	9.97370E-01	9.78656E-01
1.02438E 00	9.94900E-01	1.00060E 00	4.92308E-01	9.85564E-01	1.00207E 00	1.10535E 00	9.97939E-01	9.83532E-01
1.08534E 00	9.96000E-01	1.00049E 00	4.93985E-01	9.88711E-01	1.00164E 00	1.08565E 00	9.98366E-01	9.87095E-01
1.14884E 00	9.97500E-01	1.00032E 00	4.96263E-01	9.92972E-01	1.00104E 00	1.05625E 00	9.98963E-01	9.91943E-01
1.19964E 00	9.98000E-01	1.00026E 00	4.97017E-01	9.94379E-01	1.00083E 00	1.04576E 00	9.99166E-01	9.93550E-01
1.27584E 00	9.99000E-01	1.00013E 00	4.98526E-01	9.97193E-01	1.00042E 00	1.02352E 00	9.99579E-01	9.96772E-01
1.33934E 00	9.99500E-01	1.00007E 00	4.99281E-01	9.98597E-01	1.00021E 00	1.01192E 00	9.99788E-01	9.98386E-01
1.40538E 00	1.00000E 00	1.00000E 00	5.00030E-01	9.99990E-01	1.00000E 00	1.00000E 00	9.99999E-01	9.99990E-01
1.47142E 00	1.00000E 00	1.00000E 00	5.00030E-01	9.99990E-01	1.00000E 00	1.00000E 00	9.99999E-01	9.99990E-01
1.53238E 00	1.00000E 00	1.00000E 00	5.00035E-01	1.00000E 00	1.00000E 00	1.00000E 00	1.00000E 00	1.00000E 00

THE DATA

Y*US/DS	VEL DEF	Y+	U+	Y/D	C. WAKE	REY	U/U1
0.0	2.6637E 01	0.0	0.0	0.0	0.0	0.0	0.0
1.6227E-02	1.2208E 01	1.8363E 03	1.4429E 01	4.8025E-02	4.0832E 00	4.8428E 04	5.4169E-01
6.5613E-03	1.0200E 01	7.4252E 02	1.6437E 01	1.9419E-02	2.2030E 00	1.9582E 04	6.1709E-01
8.6778E-03	9.4410E 00	9.8204E 02	1.7196E 01	2.5683E-02	2.1712E 00	2.5898E 04	6.4557E-01
1.1500E-02	8.8352E 00	1.3014E 03	1.7802E 01	3.4035E-02	2.2091E 00	3.4321E 04	6.6831E-01
1.5733E-02	8.3902E 00	1.7804E 03	1.8247E 01	4.6563E-02	2.3528E 00	4.6954E 04	6.8502E-01
1.9260E-02	7.8242E 00	2.1796E 03	1.8813E 01	5.7004E-02	2.3215E 00	5.7482E 04	7.0626E-01
2.6316E-02	7.1039E 00	2.9780E 03	1.9533E 01	7.7884E-02	2.3407E 00	7.8537E 04	7.3330E-01
2.9843E-02	6.8177E 00	3.3773E 03	1.9819E 01	8.8324E-02	2.3502E 00	8.9065E 04	7.4405E-01
3.3371E-02	6.5922E 00	3.7765E 03	2.0045E 01	9.8765E-02	2.3712E 00	9.9593E 04	7.5252E-01
3.7604E-02	6.2056E 00	4.2555E 03	2.0431E 01	1.1129E-01	2.3290E 00	1.1223E 05	7.6703E-01
4.0426E-02	6.0314E 00	4.5749E 03	2.0605E 01	1.1964E-01	2.3301E 00	1.2065E 05	7.7357E-01
4.3953E-02	5.8168E 00	4.9741E 03	2.0820E 01	1.3009E-01	2.3255E 00	1.3118E 05	7.8162E-01
4.7481E-02	5.5519E 00	5.3733E 03	2.1085E 01	1.4053E-01	2.2914E 00	1.4170E 05	7.9157E-01
5.1008E-02	5.4994E 00	5.7725E 03	2.1137E 01	1.5097E-01	2.3457E 00	1.5223E 05	7.9354E-01
5.4536E-02	5.2913E 00	6.1717E 03	2.1345E 01	1.6141E-01	2.3257E 00	1.6276E 05	8.0135E-01
5.8064E-02	5.1266E 00	6.5709E 03	2.1510E 01	1.7185E-01	2.3203E 00	1.7329E 05	8.0754E-01
6.1591E-02	5.0755E 00	6.9701E 03	2.1561E 01	1.8229E-01	2.3615E 00	1.8381E 05	8.0946E-01
6.5119E-02	4.9230E 00	7.3693E 03	2.1714E 01	1.9273E-01	2.3540E 00	1.9434E 05	8.1518E-01
6.7941E-02	4.7718E 00	7.6886E 03	2.1865E 01	2.0108E-01	2.3327E 00	2.0276E 05	8.2086E-01
7.2379E-02	4.4243E 00	8.2475E 03	2.2212E 01	2.1570E-01	2.2542E 00	2.1750E 05	8.3390E-01
7.9229E-02	4.2778E 00	8.9661E 03	2.2359E 01	2.3449E-01	2.2794E 00	2.3645E 05	8.3940E-01
8.6284E-02	3.8828E 00	9.7645E 03	2.2754E 01	2.5537E-01	2.1961E 00	2.5751E 05	8.5423E-01
9.3339E-02	3.8352E 00	1.0563E 04	2.2802E 01	2.7625E-01	2.2599E 00	2.7856E 05	8.5602E-01
1.0039E-01	3.6463E 00	1.1361E 04	2.2990E 01	2.9713E-01	2.2546E 00	2.9962E 05	8.6311E-01
1.0745E-01	3.4595E 00	1.2160E 04	2.3177E 01	3.1801E-01	2.2450E 00	3.2068E 05	8.7012E-01
1.1450E-01	3.0830E 00	1.2958E 04	2.3554E 01	3.3889E-01	2.1462E 00	3.4173E 05	8.8426E-01
1.2156E-01	2.9022E 00	1.3757E 04	2.3735E 01	3.5977E-01	2.1304E 00	3.6279E 05	8.9104E-01
1.2861E-01	2.7234E 00	1.4555E 04	2.3913E 01	3.8065E-01	2.1118E 00	3.8384E 05	8.9776E-01
1.3567E-01	2.5374E 00	1.5353E 04	2.4099E 01	4.0153E-01	2.0868E 00	4.0490E 05	9.0474E-01
1.4273E-01	2.2325E 00	1.6152E 04	2.4404E 01	4.2241E-01	2.0059E 00	4.2595E 05	9.1619E-01
1.6107E-01	1.8904E 00	1.8228E 04	2.4746E 01	4.7670E-01	1.9842E 00	4.8070E 05	9.2903E-01
1.7800E-01	1.8060E 00	2.0144E 04	2.4831E 01	5.2681E-01	2.0544E 00	5.3123E 05	9.3220E-01
1.9634E-01	1.5888E 00	2.2220E 04	2.5048E 01	5.8110E-01	2.0635E 00	5.8598E 05	9.4035E-01
2.1469E-01	1.2197E 00	2.4295E 04	2.5417E 01	6.3539E-01	1.9955E 00	6.4072E 05	9.5421E-01
2.3091E-01	9.5136E-01	2.6132E 04	2.5785E 01	6.8342E-01	1.9102E 00	6.8915E 05	9.6804E-01
2.4926E-01	6.5503E-01	2.8208E 04	2.5982E 01	7.3771E-01	1.9051E 00	7.4389E 05	9.7541E-01
2.6690E-01	4.9979E-01	3.0204E 04	2.6137E 01	7.8991E-01	1.9096E 00	7.9653E 05	9.8124E-01
2.8453E-01	3.8454E-01	3.2200E 04	2.6252E 01	8.4211E-01	1.9272E 00	8.4917E 05	9.8556E-01
3.0147E-01	3.0072E-01	3.4116E 04	2.6336E 01	8.9222E-01	1.9520E 00	8.9970E 05	9.8871E-01
3.1910E-01	1.8720E-01	3.6112E 04	2.6450E 01	9.4442E-01	1.9626E 00	9.5234E 05	9.9297E-01
3.3321E-01	1.4971E-01	3.7709E 04	2.6487E 01	9.8618E-01	1.9924E 00	9.9445E 05	9.9438E-01
3.5438E-01	7.4776E-02	4.0104E 04	2.6562E 01	1.0488E 00	2.0252E 00	1.0576E 06	9.9719E-01
3.7202E-01	3.7364E-02	4.2100E 04	2.6599E 01	1.1010E 00	2.0607E 00	1.1103E 06	9.9860E-01
3.9036E-01	2.5403E-04	4.4176E 04	2.6637E 01	1.1553E 00	2.0958E 00	1.1650E 06	9.9999E-01
4.0870E-01	2.5403E-04	4.6252E 04	2.6637E 01	1.2096E 00	2.1451E 00	1.2197E 06	9.9999E-01
4.2564E-01	1.5877E-06	4.8168E 04	2.6637E 01	1.2597E 00	2.1885E 00	1.2703E 06	1.0000E 00

PI FOR COLES WAKE FUNCTION = -2.1835E 00

RUN NUMBER 76- 26

THIS DATA REDUCTION SHOT IS FOR AN ADIABATIC WALL

RECOVERY FACTOR = 0.8800

PRANDTL NUMBER = 0.8090

GAMMA = 1.4000

FREE-STREAM UNIT REYNOLDS NO. PER METER= 1.0051E 07

DELTA(CM) = 1.1628E 00

DELTA STAR(CM) = 1.3965E-01 DELTA STAR(CM) NEW = 1.3957E-01

THETA(CM) = 9.9710E-02 THETA(CM) NEW = 1.0006E-01

SHAPE FACTOR = 1.4005E 00 NEW SHAPE FACTOR = 1.3948E 00

SKIN FRICTION = 2.6000E-03

Y	PT2	TO/TOE	M	U/UE	T/TE	TBAR	RHO/RHOE	RHO*U/(RHOE*UE)
0.0	8.43002E-01	9.94284E-01	0.0	0.0	1.04400E 00	0.0	9.57850E-01	0.0
5.84200E-03	8.86800E-01	9.97034E-01	2.69971E-01	5.48437E-01	1.03185E 00	4.81170E-01	9.69131E-01	5.31507E-01
1.85420E-02	9.00400E-01	9.97860E-01	3.08206E-01	6.25007E-01	1.02822E 00	6.25616E-01	9.72550E-01	6.07851E-01
3.37820E-02	9.05000E-01	9.98137E-01	3.20024E-01	6.48590E-01	1.02701E 00	6.74082E-01	9.73697E-01	6.31530E-01
4.64820E-02	9.08500E-01	9.98346E-01	3.28697E-01	6.65871E-01	1.02610E 00	7.10631E-01	9.74566E-01	6.48935E-01
5.91820E-02	9.12000E-01	9.98554E-01	3.37133E-01	6.82657E-01	1.02518E 00	7.47020E-01	9.75435E-01	6.65888E-01
6.98500E-02	9.14100E-01	9.98678E-01	3.42083E-01	6.92495E-01	1.02464E 00	7.68791E-01	9.75954E-01	6.75843E-01
8.45820E-02	9.17100E-01	9.98855E-01	3.49017E-01	7.06264E-01	1.02386E 00	7.99619E-01	9.76696E-01	6.89805E-01
9.47419E-02	9.20100E-01	9.99031E-01	3.55803E-01	7.19722E-01	1.02309E 00	8.30446E-01	9.77435E-01	7.03482E-01
1.15062E-01	9.22500E-01	9.99171E-01	3.61124E-01	7.30265E-01	1.02247E 00	8.54918E-01	9.78026E-01	7.14218E-01
1.32842E-01	9.25200E-01	9.99327E-01	3.67011E-01	7.41919E-01	1.02177E 00	8.82250E-01	9.78691E-01	7.26109E-01
1.45542E-01	9.28200E-01	9.99499E-01	3.73425E-01	7.54601E-01	1.02100E 00	9.12283E-01	9.79427E-01	7.39077E-01
1.58242E-01	9.31200E-01	9.99668E-01	3.79718E-01	7.67029E-01	1.02024E 00	9.41840E-01	9.80164E-01	7.51815E-01
1.70942E-01	9.32800E-01	9.99757E-01	3.83032E-01	7.73567E-01	1.01983E 00	9.57413E-01	9.80559E-01	7.58528E-01
1.83642E-01	9.32800E-01	9.99757E-01	3.83032E-01	7.73567E-01	1.01983E 00	9.57413E-01	9.80559E-01	7.58528E-01
2.01422E-01	9.36800E-01	9.99978E-01	3.91162E-01	7.89591E-01	1.01881E 00	9.96186E-01	9.81541E-01	7.75016E-01
2.09042E-01	9.38300E-01	1.00006E 00	3.94161E-01	7.95497E-01	1.01842E 00	1.01049E 00	9.81909E-01	7.81105E-01
2.21742E-01	9.38800E-01	1.00009E 00	3.95158E-01	7.97458E-01	1.01830E 00	1.01525E 00	9.82032E-01	7.83130E-01
2.59842E-01	9.43900E-01	1.00035E 00	4.05138E-01	8.17076E-01	1.01699E 00	1.06213E 00	9.83289E-01	8.03422E-01
2.87782E-01	9.47400E-01	1.00053E 00	4.11827E-01	8.30200E-01	1.01610E 00	1.09296E 00	9.84157E-01	8.17047E-01
3.08102E-01	9.49900E-01	1.00065E 00	4.16524E-01	8.39404E-01	1.01546E 00	1.11409E 00	9.84779E-01	8.26627E-01
3.38582E-01	9.53000E-01	1.00079E 00	4.22272E-01	8.50651E-01	1.01465E 00	1.13888E 00	9.85557E-01	8.38365E-01
3.63982E-01	9.57500E-01	1.00098E 00	4.30453E-01	8.66629E-01	1.01348E 00	1.17210E 00	9.86697E-01	8.55101E-01
3.89382E-01	9.59000E-01	1.00104E 00	4.33136E-01	8.71862E-01	1.01309E 00	1.18227E 00	9.87081E-01	8.60599E-01
4.12242E-01	9.62600E-01	1.00117E 00	4.39502E-01	8.84259E-01	1.01213E 00	1.20435E 00	9.88014E-01	8.73660E-01
4.37642E-01	9.63600E-01	1.00120E 00	4.41251E-01	8.87659E-01	1.01186E 00	1.20976E 00	9.88276E-01	8.77253E-01
5.16382E-01	9.67100E-01	1.00129E 00	4.47315E-01	8.99435E-01	1.01091E 00	1.22644E 00	9.89207E-01	8.89727E-01
5.77850E-01	9.73200E-01	1.00139E 00	4.57642E-01	9.19422E-01	1.00920E 00	1.24392E 00	9.90887E-01	9.11042E-01
6.40842E-01	9.78300E-01	1.00140E 00	4.66072E-01	9.35659E-01	1.00769E 00	1.24440E 00	9.92364E-01	9.28515E-01
7.04342E-01	9.83800E-01	1.00129E 00	4.74960E-01	9.52689E-01	1.00598E 00	1.22596E 00	9.94060E-01	9.47029E-01
7.67842E-01	9.85300E-01	1.00124E 00	4.77349E-01	9.57246E-01	1.00548E 00	1.21675E 00	9.94545E-01	9.52024E-01
8.33882E-01	9.88400E-01	1.00109E 00	4.82243E-01	9.66557E-01	1.00444E 00	1.19132E 00	9.95583E-01	9.62288E-01
8.92302E-01	9.92400E-01	1.00082E 00	4.88467E-01	9.78335E-01	1.00301E 00	1.14429E 00	9.97000E-01	9.75400E-01
9.60882E-01	9.94900E-01	1.00060E 00	4.92308E-01	9.85564E-01	1.00207E 00	1.10535E 00	9.97939E-01	9.83532E-01
1.02184E 00	9.96500E-01	1.00044E 00	4.94747E-01	9.90138E-01	1.00144E 00	1.07627E 00	9.98563E-01	9.88715E-01
1.08534E 00	9.97500E-01	1.00032E 00	4.96263E-01	9.92972E-01	1.00104E 00	1.05625E 00	9.98963E-01	9.91943E-01
1.14884E 00	9.98000E-01	1.00026E 00	4.97017E-01	9.94379E-01	1.00083E 00	1.04576E 00	9.99166E-01	9.93550E-01
1.21234E 00	9.99000E-01	1.00013E 00	4.98526E-01	9.97193E-01	1.00042E 00	1.02352E 00	9.99579E-01	9.96772E-01
1.27584E 00	9.99500E-01	1.00007E 00	4.99281E-01	9.98597E-01	1.00021E 00	1.01192E 00	9.99788E-01	9.98386E-01
1.33934E 00	1.00000E 00	1.00000E 00	5.00030E-01	9.99990E-01	1.00000E 00	1.00000E 00	9.99999E-01	9.99990E-01
1.40284E 00	1.00000E 00	1.00000E 00	5.00030E-01	9.99990E-01	1.00000E 00	1.00000E 00	9.99999E-01	9.99990E-01
1.46634E 00	1.00000E 00	1.00000E 00	5.00035E-01	1.00000E 00	1.00000E 00	1.00000E 00	1.00000E 00	1.00000E 00

THE DATA

Y*US/DS	VEL DEF	Y+	U+	Y/D	C. WAKE	REY	U/U1
0.0	2.7144E 01	0.0	0.0	0.0	0.0	0.0	0.0
1.5420E-03	1.2257E 01	1.8208E 02	1.4887E 01	5.0239E-03	1.5707E 00	4.8933E 03	5.4844E-01
4.8942E-03	1.0179E 01	5.7791E 02	1.6965E 01	1.5945E-02	1.9679E 00	1.5531E 04	6.2501E-01
8.9169E-03	9.5387E 00	1.0529E 03	1.7605E 01	2.9051E-02	2.3986E 00	2.8296E 04	6.4859E-01
1.2269E-02	9.0657E 00	1.4487E 03	1.8075E 01	3.9973E-02	2.5608E 00	3.8934E 04	6.6587E-01
1.5621E-02	8.6140E 00	1.8446E 03	1.8530E 01	5.0894E-02	2.6313E 00	4.9572E 04	6.8266E-01
1.8437E-02	8.3470E 00	2.1771E 03	1.8797E 01	6.0068E-02	2.7031E 00	5.8507E 04	6.9249E-01
2.2326E-02	7.9732E 00	2.6362E 03	1.9171E 01	7.2737E-02	2.7520E 00	7.0847E 04	7.0626E-01
2.5007E-02	7.6079E 00	2.9529E 03	1.9536E 01	8.1474E-02	2.7068E 00	7.9357E 04	7.1972E-01
3.0371E-02	7.3217E 00	3.5862E 03	1.9822E 01	9.8948E-02	2.8043E 00	9.6377E 04	7.3027E-01
3.5064E-02	7.0054E 00	4.1404E 03	2.0139E 01	1.1424E-01	2.8223E 00	1.1127E 05	7.4192E-01
3.8416E-02	6.6612E 00	4.5362E 03	2.0483E 01	1.2516E-01	2.7598E 00	1.2191E 05	7.5460E-01
4.1769E-02	6.3238E 00	4.9320E 03	2.0820E 01	1.3608E-01	2.6912E 00	1.3255E 05	7.6703E-01
4.5121E-02	6.1463E 00	5.3279E 03	2.0998E 01	1.4700E-01	2.6969E 00	1.4318E 05	7.7357E-01
4.8473E-02	6.1463E 00	5.7237E 03	2.0998E 01	1.5792E-01	2.7871E 00	1.5382E 05	7.7357E-01
5.3166E-02	5.7114E 00	6.2779E 03	2.1433E 01	1.7321E-01	2.6790E 00	1.6871E 05	7.8959E-01
5.5177E-02	5.5511E 00	6.5154E 03	2.1593E 01	1.7977E-01	2.6431E 00	1.7510E 05	7.9550E-01
5.8530E-02	5.4578E 00	6.9112E 03	2.1646E 01	1.9069E-01	2.6898E 00	1.8573E 05	7.9746E-01
6.8586E-02	4.9653E 00	8.0987E 03	2.2179E 01	2.2345E-01	2.6144E 00	2.1765E 05	8.1708E-01
7.5961E-02	4.6091E 00	8.9695E 03	2.2535E 01	2.4748E-01	2.5590E 00	2.4105E 05	8.3020E-01
8.1325E-02	4.3593E 00	9.6028E 03	2.2785E 01	2.6495E-01	2.5158E 00	2.5807E 05	8.3940E-01
8.9370E-02	4.0540E 00	1.0553E 04	2.3090E 01	2.9117E-01	2.4768E 00	2.8360E 05	8.5065E-01
9.6074E-02	3.8202E 00	1.1344E 04	2.3524E 01	3.1301E-01	2.3439E 00	3.0488E 05	8.6663E-01
1.0278E-01	3.4782E 00	1.2136E 04	2.3666E 01	3.3485E-01	2.3553E 00	3.2615E 05	8.7186E-01
1.0881E-01	3.1417E 00	1.2849E 04	2.4003E 01	3.5451E-01	2.2533E 00	3.4530E 05	8.8426E-01
1.1552E-01	3.0494E 00	1.3640E 04	2.4095E 01	3.7635E-01	2.2806E 00	3.6657E 05	8.8766E-01
1.3630E-01	2.7298E 00	1.6094E 04	2.4414E 01	4.4407E-01	2.3231E 00	4.3253E 05	8.9943E-01
1.5253E-01	2.1872E 00	1.8010E 04	2.4957E 01	4.9693E-01	2.1841E 00	4.8401E 05	9.1942E-01
1.6915E-01	1.7465E 00	1.9974E 04	2.5398E 01	5.5110E-01	2.0863E 00	5.3678E 05	9.3566E-01
1.8591E-01	1.2842E 00	2.1953E 04	2.5860E 01	6.0570E-01	1.9661E 00	5.8997E 05	9.5269E-01
2.0267E-01	1.1605E 00	2.3932E 04	2.5984E 01	6.6031E-01	2.0102E 00	6.4315E 05	9.5725E-01
2.2011E-01	9.0779E-01	2.5990E 04	2.6236E 01	7.1710E-01	1.9830E 00	6.9847E 05	9.6656E-01
2.3553E-01	5.8807E-01	2.7811E 04	2.6556E 01	7.6734E-01	1.9027E 00	7.4740E 05	9.7834E-01
2.5363E-01	3.5186E-01	2.9948E 04	2.6752E 01	8.2632E-01	1.8940E 00	8.0485E 05	9.8556E-01
2.6972E-01	2.6769E-01	3.1848E 04	2.6877E 01	8.7874E-01	1.9068E 00	8.5591E 05	9.9014E-01
2.8648E-01	1.9076E-01	3.3828E 04	2.6953E 01	9.3335E-01	1.9423E 00	9.0910E 05	9.9297E-01
3.0324E-01	1.5257E-01	3.5807E 04	2.6992E 01	9.8796E-01	1.9936E 00	9.6228E 05	9.9438E-01
3.2000E-01	7.6201E-02	3.7786E 04	2.7068E 01	1.0426E 00	2.0213E 00	1.0155E 06	9.9719E-01
3.3676E-01	3.8076E-02	3.9765E 04	2.7106E 01	1.0972E 00	2.0653E 00	1.0687E 06	9.9860E-01
3.5352E-01	2.5887E-04	4.1744E 04	2.7144E 01	1.1518E 00	2.1063E 00	1.1218E 06	9.9999E-01
3.7029E-01	2.5887E-04	4.3723E 04	2.7144E 01	1.2064E 00	2.1641E 00	1.1750E 06	9.9999E-01
3.8705E-01	1.6179E-06	4.5702E 04	2.7144E 01	1.2610E 00	2.2191E 00	1.2282E 06	1.0000E 00

PI FOR COLES WAKE FUNCTION = -1.8714E 00

RUN NUMBER 76- 30

THIS DATA REDUCTION SHOT IS FOR AN ADIABATIC WALL

RECOVERY FACTOR = 0.8800

PRANDTL NUMBER = 0.8090

GAMMA = 1.4000

FREE-STREAM UNIT REYNOLDS NO. PER METER= 9.8553E 06

DELTA(CM) = 8.1422E-01

DELTA STAR(CM) = 9.5298E-02 DELTA STAR(CM) NEW = 9.4977E-02

THETA(CM) = 6.5501E-02 THETA(CM) NEW = 6.5933E-02

SHAPE FACTOR = 1.4536E 00 NEW SHAPE FACTOR = 1.4405E 00

SKIN FRICTION = 2.8000E-03

Y	PT2	TO/TOE	M	U/UE	T/TE	TBAR	RHO/RHOE	RHO*U/(RHOE*UE)
0.0	8.43002E-01	9.94284E-01	0.0	0.0	1.04400E 00	0.0	9.57850E-01	0.0
5.84200E-03	8.77200E-01	9.96443E-01	2.39019E-01	4.86169E-01	1.03445E 00	3.77721E-01	9.66695E-01	4.69977E-01
1.85420E-02	8.92200E-01	9.97364E-01	2.85818E-01	5.80220E-01	1.03040E 00	5.38853E-01	9.70493E-01	5.63100E-01
3.12420E-02	9.00100E-01	9.97843E-01	3.07416E-01	6.23429E-01	1.02831E 00	6.22597E-01	9.72473E-01	6.06268E-01
4.39420E-02	9.08600E-01	9.98352E-01	3.28944E-01	6.66362E-01	1.02607E 00	7.11584E-01	9.74592E-01	6.49431E-01
6.17220E-02	9.14600E-01	9.98708E-01	3.43245E-01	6.94803E-01	1.02451E 00	7.73876E-01	9.76078E-01	6.78182E-01
8.45820E-02	9.21600E-01	9.99117E-01	3.59138E-01	7.26331E-01	1.02270E 00	8.45543E-01	9.77805E-01	7.10211E-01
1.07442E-01	9.27600E-01	9.99464E-01	3.72153E-01	7.52086E-01	1.02116E 00	9.06245E-01	9.79280E-01	7.36503E-01
1.32842E-01	9.36600E-01	9.99967E-01	3.90759E-01	7.88799E-01	1.01886E 00	9.94279E-01	9.81491E-01	7.74199E-01
1.58242E-01	9.39100E-01	1.00010E 00	3.95755E-01	7.98633E-01	1.01822E 00	1.01812E 00	9.82106E-01	7.84342E-01
1.86182E-01	9.44600E-01	1.00039E 00	4.06484E-01	8.19717E-01	1.01682E 00	1.06849E 00	9.83462E-01	8.06161E-01
2.09042E-01	9.50100E-01	1.00066E 00	4.16902E-01	8.40144E-01	1.01540E 00	1.11568E 00	9.84830E-01	8.27398E-01
2.36982E-01	9.56100E-01	1.00093E 00	4.27925E-01	8.61697E-01	1.01385E 00	1.16224E 00	9.86340E-01	8.49926E-01
2.62382E-01	9.60800E-01	1.00111E 00	4.36334E-01	8.78092E-01	1.01261E 00	1.19371E 00	9.87546E-01	8.67156E-01
2.85242E-01	9.64100E-01	1.00121E 00	4.42125E-01	8.89359E-01	1.01173E 00	1.21246E 00	9.88408E-01	8.79050E-01
3.23342E-01	9.67500E-01	1.00130E 00	4.47997E-01	9.00757E-01	1.01080E 00	1.22803E 00	9.89314E-01	8.91131E-01
3.61442E-01	9.71500E-01	1.00137E 00	4.54794E-01	9.13919E-01	1.00968E 00	1.24058E 00	9.90410E-01	9.05154E-01
3.91922E-01	9.72000E-01	1.00138E 00	4.55632E-01	9.15538E-01	1.00954E 00	1.24186E 00	9.90549E-01	9.06885E-01
4.12242E-01	9.77000E-01	1.00140E 00	4.63944E-01	9.31569E-01	1.00808E 00	1.24567E 00	9.91980E-01	9.24098E-01
4.65582E-01	9.84000E-01	1.00128E 00	4.75281E-01	9.53302E-01	1.00591E 00	1.22485E 00	9.94125E-01	9.47701E-01
5.13842E-01	9.96500E-01	1.00043E 00	4.94747E-01	9.90137E-01	1.00144E 00	1.07612E 00	9.98564E-01	9.88715E-01
5.77342E-01	9.92000E-01	1.00086E 00	4.87847E-01	9.77163E-01	1.00316E 00	1.14969E 00	9.96854E-01	9.74089E-01
6.40842E-01	9.94000E-01	1.00069E 00	4.90926E-01	9.32966E-01	1.00241E 00	1.12029E 00	9.97595E-01	9.80602E-01
7.04342E-01	9.96500E-01	1.00044E 00	4.94747E-01	9.90138E-01	1.00144E 00	1.07627E 00	9.98563E-01	9.88715E-01
7.70382E-01	9.97500E-01	1.00032E 00	4.96263E-01	9.92972E-01	1.00104E 00	1.05625E 00	9.98963E-01	9.91943E-01
8.31342E-01	9.98500E-01	1.00020E 00	4.97774E-01	9.95792E-01	1.00063E 00	1.03480E 00	9.99372E-01	9.95167E-01
8.97382E-01	9.99600E-01	1.00005E 00	4.99429E-01	9.98873E-01	1.00017E 00	1.00953E 00	9.99830E-01	9.98703E-01
9.58342E-01	1.00000E 00	1.00000E 00	5.00030E-01	9.99990E-01	1.00000E 00	1.00000E 00	9.99999E-01	9.99990E-01
1.02438E 00	1.00000E 00	1.00000E 00	5.00030E-01	9.99990E-01	1.00000E 00	1.00000E 00	9.99999E-01	9.99990E-01
1.08534E 00	1.00000E 00	1.00000E 00	5.00030E-01	9.99990E-01	1.00000E 00	1.00000E 00	9.99999E-01	9.99990E-01
1.15138E 00	1.00000E 00	1.00000E 00	5.00030E-01	9.99990E-01	1.00000E 00	1.00000E 00	9.99999E-01	9.99990E-01
1.21234E 00	1.00000E 00	1.00000E 00	5.00030E-01	9.99990E-01	1.00000E 00	1.00000E 00	9.99999E-01	9.99990E-01
1.28854E 00	1.00000E 00	1.00000E 00	5.00035E-01	1.00000E 00	1.00000E 00	1.00000E 00	1.00000E 00	1.00000E 00

THE DATA

Y*US/DS	VEL DEF	Y+	U+	Y/D	C. WAKE	REY	U/U1
0.0	2.6157E 01	0.0	0.0	0.0	0.0	0.0	0.0
2.3516E-03	1.3440E 01	1.8527E 02	1.2717E 01	7.1750E-03	2.6160E 00	4.7979E 03	4.8617E-01
7.4636E-03	1.0980E 01	5.8803E 02	1.5177E 01	2.2773E-02	2.8080E 00	1.5228E 04	5.8022E-01
1.2576E-02	9.8499E 00	9.9079E 02	1.6307E 01	3.8371E-02	2.8835E 00	2.5658E 04	6.2343E-01
1.7688E-02	8.7269E 00	1.3935E 03	1.7430E 01	5.3968E-02	2.7409E 00	3.6088E 04	6.6636E-01
2.4845E-02	7.9830E 00	1.9574E 03	1.8174E 01	7.5805E-02	2.7848E 00	5.0691E 04	6.9480E-01
3.4047E-02	7.1583E 00	2.6824E 03	1.8999E 01	1.0388E-01	2.7579E 00	6.9465E 04	7.2633E-01
4.3248E-02	6.4846E 00	3.4073E 03	1.9672E 01	1.3196E-01	2.7134E 00	8.8239E 04	7.5209E-01
5.3472E-02	5.5243E 00	4.2129E 03	2.0632E 01	1.6315E-01	2.4931E 00	1.0910E 05	7.8880E-01
6.3697E-02	5.2671E 00	5.0184E 03	2.0890E 01	1.9435E-01	2.5775E 00	1.2996E 05	7.9863E-01
7.4943E-02	4.7156E 00	5.9044E 03	2.1441E 01	2.2866E-01	2.5001E 00	1.5291E 05	8.1972E-01
8.4145E-02	4.1813E 00	6.6294E 03	2.1975E 01	2.5674E-01	2.3745E 00	1.7168E 05	8.4014E-01
9.5392E-02	3.6176E 00	7.5155E 03	2.2539E 01	2.9106E-01	2.2458E 00	1.9463E 05	8.6170E-01
1.0562E-01	3.1887E 00	8.3210E 03	2.2968E 01	3.2225E-01	2.1556E 00	2.1549E 05	8.7809E-01
1.1482E-01	2.8940E 00	9.0460E 03	2.3263E 01	3.5033E-01	2.1099E 00	2.3426E 05	8.8936E-01
1.3015E-01	2.5959E 00	1.0254E 04	2.3561E 01	3.9712E-01	2.1132E 00	2.6555E 05	9.0076E-01
1.4549E-01	2.2516E 00	1.1463E 04	2.3905E 01	4.4391E-01	2.0764E 00	2.9684E 05	9.1392E-01
1.5776E-01	2.2092E 00	1.2429E 04	2.3948E 01	4.8135E-01	2.1532E 00	3.2187E 05	9.1554E-01
1.6594E-01	1.7899E 00	1.3074E 04	2.4367E 01	5.0631E-01	2.0055E 00	3.3856E 05	9.3157E-01
1.8741E-01	1.2215E 00	1.4765E 04	2.4935E 01	5.7182E-01	1.8693E 00	3.8237E 05	9.5330E-01
2.0684E-01	2.5798E-01	1.6296E 04	2.5899E 01	6.3109E-01	1.5087E 00	4.2200E 05	9.9014E-01
2.3240E-01	5.9734E-01	1.8309E 04	2.5559E 01	7.0908E-01	1.8182E 00	4.7416E 05	9.7716E-01
2.5796E-01	4.4555E-01	2.0323E 04	2.5711E 01	7.8707E-01	1.8684E 00	5.2631E 05	9.8297E-01
2.8352E-01	2.5796E-01	2.2337E 04	2.5899E 01	8.6506E-01	1.8888E 00	5.7846E 05	9.9014E-01
3.1010E-01	1.8382E-01	2.4431E 04	2.5973E 01	9.4616E-01	1.9598E 00	6.3269E 05	9.9297E-01
3.3464E-01	1.1006E-01	2.6365E 04	2.6047E 01	1.0210E 00	2.0147E 00	6.8276E 05	9.9579E-01
3.6122E-01	2.9480E-02	2.8459E 04	2.6127E 01	1.1021E 00	2.0666E 00	7.3700E 05	9.9887E-01
3.8576E-01	2.4945E-04	3.0392E 04	2.6157E 01	1.1770E 00	2.1311E 00	7.8706E 05	9.9999E-01
4.1234E-01	2.4945E-04	3.2487E 04	2.6157E 01	1.2581E 00	2.2112E 00	8.4130E 05	9.9999E-01
4.3688E-01	2.4945E-04	3.4420E 04	2.6157E 01	1.3330E 00	2.2807E 00	8.9136E 05	9.9999E-01
4.6346E-01	2.4945E-04	3.6514E 04	2.6157E 01	1.4141E 00	2.3516E 00	9.4560E 05	9.9999E-01
4.8800E-01	2.4945E-04	3.8447E 04	2.6157E 01	1.4890E 00	2.4136E 00	9.9566E 05	9.9999E-01
5.1867E-01	1.5591E-06	4.0864E 04	2.6157E 01	1.5826E 00	2.4867E 00	1.0582E 06	1.0000E 00

PI FOR COLES WAKE FUNCTION = -1.9431E 00

RUN NUMBER 76- 24

THIS DATA REDUCTION SHOT IS FOR AN ADIABATIC WALL

RECOVERY FACTOR = 0.8800

PRANDTL NUMBER = 0.8090

GAMMA = 1.4000

FREE-STREAM UNIT REYNOLDS NO. PER METER= 9.8605E 06

DELTA(CM) = 1.3222E 00

DELTA STAR(CM) = 1.6188E-01 DELTA STAR(CM) NEW = 1.6179E-01

THETA(CM) = 1.1597E-01 THETA(CM) NEW = 1.1632E-01

SHAPE FACTOR = 1.3959E 00 NEW SHAPE FACTOR = 1.3910E 00

SKIN FRICTION = 2.6000E-03

Y	PT2	TO/TOE	M	U/UE	T/TE	TBAR	RHO/RHOE	RHO*U/(RHOE*UE)
0.0	8.43002E-01	9.94284E-01	0.0	0.0	1.04400E 00	0.0	9.57850E-01	0.0
5.84200E-03	8.84600E-01	9.96899E-01	2.63219E-01	5.34874E-01	1.03244E 00	4.57492E-01	9.68575E-01	5.18065E-01
1.72720E-02	8.97700E-01	9.97697E-01	3.01029E-01	6.10665E-01	1.02894E 00	5.97013E-01	9.71874E-01	5.93489E-01
3.63220E-02	9.04300E-01	9.98095E-01	3.18253E-01	6.45059E-01	1.02720E 00	6.66773E-01	9.73521E-01	6.27979E-01
4.52120E-02	9.08300E-01	9.98334E-01	3.28211E-01	6.64903E-01	1.02615E 00	7.08565E-01	9.74517E-01	6.47959E-01
5.66420E-02	9.09800E-01	9.98423E-01	3.31859E-01	6.72165E-01	1.02576E 00	7.24138E-01	9.74889E-01	6.55286E-01
6.42620E-02	9.14400E-01	9.98696E-01	3.42779E-01	6.93878E-01	1.02456E 00	7.71810E-01	9.76029E-01	6.77245E-01
8.20420E-02	9.17400E-01	9.98873E-01	3.49699E-01	7.07618E-01	1.02378E 00	8.02797E-01	9.76769E-01	6.91179E-01
9.72819E-02	9.18900E-01	9.98961E-01	3.53105E-01	7.14375E-01	1.02340E 00	8.18211E-01	9.77139E-01	6.98044E-01
1.07442E-01	9.19900E-01	9.99019E-01	3.55354E-01	7.18832E-01	1.02314E 00	8.28381E-01	9.77386E-01	7.02577E-01
1.22682E-01	9.23400E-01	9.99223E-01	3.63099E-01	7.34176E-01	1.02224E 00	8.63976E-01	9.78248E-01	7.18206E-01
1.32842E-01	9.23900E-01	9.99252E-01	3.64187E-01	7.36331E-01	1.02211E 00	8.69061E-01	9.78370E-01	7.20404E-01
1.45542E-01	9.22900E-01	9.99193E-01	3.62001E-01	7.32002E-01	1.02236E 00	8.58891E-01	9.78125E-01	7.15989E-01
1.60782E-01	9.24900E-01	9.99309E-01	3.66361E-01	7.40632E-01	1.02185E 00	8.79072E-01	9.78618E-01	7.24796E-01
1.83642E-01	9.30900E-01	9.99651E-01	3.79096E-01	7.65802E-01	1.02031E 00	9.38980E-01	9.80091E-01	7.50555E-01
1.96342E-01	9.43100E-01	1.00031E 00	4.03593E-01	8.14043E-01	1.01720E 00	1.05498E 00	9.83092E-01	8.00279E-01
2.11582E-01	9.33700E-01	9.99807E-01	3.84876E-01	7.77204E-01	1.01960E 00	9.66312E-01	9.80779E-01	7.62265E-01
2.21742E-01	9.33700E-01	9.99807E-01	3.84876E-01	7.77205E-01	1.01960E 00	9.66312E-01	9.80779E-01	7.62266E-01
2.36982E-01	9.36000E-01	9.99934E-01	3.89556E-01	7.86427E-01	1.01901E 00	9.88400E-01	9.81345E-01	7.71757E-01
2.47142E-01	9.39600E-01	1.00013E 00	3.96742E-01	8.00574E-01	1.01809E 00	1.02272E 00	9.82229E-01	7.86348E-01
2.62382E-01	9.41100E-01	1.00021E 00	3.99693E-01	8.06378E-01	1.01771E 00	1.03655E 00	9.82599E-01	7.92347E-01
2.87782E-01	9.41600E-01	1.00024E 00	4.00671E-01	8.08299E-01	1.01758E 00	1.04132E 00	9.82721E-01	7.94333E-01
3.10642E-01	9.44100E-01	1.00036E 00	4.05526E-01	8.17838E-01	1.01694E 00	1.06388E 00	9.83340E-01	8.04213E-01
3.36042E-01	9.47800E-01	1.00055E 00	4.12585E-01	8.31685E-01	1.01600E 00	1.09630E 00	9.84257E-01	8.18592E-01
3.61442E-01	9.51100E-01	1.00071E 00	4.18762E-01	8.43785E-01	1.01515E 00	1.12379E 00	9.85081E-01	8.31196E-01
3.86842E-01	9.51100E-01	1.00071E 00	4.18762E-01	8.43784E-01	1.01515E 00	1.12379E 00	9.85080E-01	8.31195E-01
4.50342E-01	9.55100E-01	1.00089E 00	4.26111E-01	8.58153E-01	1.01411E 00	1.15493E 00	9.86087E-01	8.46213E-01
5.13842E-01	9.57100E-01	1.00097E 00	4.29732E-01	8.65223E-01	1.01359E 00	1.16939E 00	9.86595E-01	8.53625E-01
5.77342E-01	9.66800E-01	1.00129E 00	4.46798E-01	8.98432E-01	1.01099E 00	1.22517E 00	9.89127E-01	8.88663E-01
6.40842E-01	9.72300E-01	1.00139E 00	4.56140E-01	9.16519E-01	1.00946E 00	1.24249E 00	9.90633E-01	9.07934E-01
7.01802E-01	9.76800E-01	1.00140E 00	4.63615E-01	9.30935E-01	1.00814E 00	1.24583E 00	9.91922E-01	9.23415E-01
7.67842E-01	9.82800E-01	1.00132E 00	4.73361E-01	9.49633E-01	1.00630E 00	1.23105E 00	9.93742E-01	9.43691E-01
8.33882E-01	9.83300E-01	1.00131E 00	4.74161E-01	9.51162E-01	1.00614E 00	1.22851E 00	9.93901E-01	9.45361E-01
8.94842E-01	9.86300E-01	1.00120E 00	4.78934E-01	9.60266E-01	1.00515E 00	1.20960E 00	9.94874E-01	9.55343E-01
9.60882E-01	9.89400E-01	1.00104E 00	4.83808E-01	9.69525E-01	1.00409E 00	1.18131E 00	9.95927E-01	9.65576E-01
1.02438E 00	9.91500E-01	1.00089E 00	4.87074E-01	9.75705E-01	1.00334E 00	1.15636E 00	9.96673E-01	9.72459E-01
1.08534E 00	9.94500E-01	1.00064E 00	4.91692E-01	9.84408E-01	1.00222E 00	1.11203E 00	9.97786E-01	9.82228E-01
1.14884E 00	9.95500E-01	1.00054E 00	4.93222E-01	9.87280E-01	1.00183E 00	1.09487E 00	9.98170E-01	9.85473E-01
1.27638E 00	9.97500E-01	1.00032E 00	4.96263E-01	9.92972E-01	1.00104E 00	1.05625E 00	9.98963E-01	9.91943E-01
1.33934E 00	9.98500E-01	1.00020E 00	4.97774E-01	9.95792E-01	1.00063E 00	1.03480E 00	9.99372E-01	9.95167E-01
1.40284E 00	9.99000E-01	1.00013E 00	4.98526E-01	9.97192E-01	1.00042E 00	1.02368E 00	9.99578E-01	9.96771E-01
1.46634E 00	9.99500E-01	1.00007E 00	4.99281E-01	9.98597E-01	1.00021E 00	1.01192E 00	9.99788E-01	9.98386E-01
1.52984E 00	1.00000E 00	1.00000E 00	5.00030E-01	9.99990E-01	1.00000E 00	1.00000E 00	9.99999E-01	9.99990E-01
1.59334E 00	1.00000E 00	1.00000E 00	5.00035E-01	1.00000E 00	1.00000E 00	1.00000E 00	1.00000E 00	1.00000E 00

THE DATA

Y*US/DS	VEL DEF	Y+	U+	Y/D	C. WAKE	REY	U/UI
0.0	2.7144E 01	0.0	0.0	0.0	0.0	0.0	0.0
1.3302E-03	1.2625E 01	1.7862E 02	1.4519E 01	4.4183E-03	1.6254E 00	4.8004E 03	5.3487E-01
3.9329E-03	1.0568E 01	5.2811E 02	1.6576E 01	1.3063E-02	1.9232E 00	1.4193E 04	6.1066E-01
8.2706E-03	9.6346E 00	1.1106E 03	1.7510E 01	2.7471E-02	2.3551E 00	2.9846E 04	6.4506E-01
1.0295E-02	9.0960E 00	1.3824E 03	1.8048E 01	3.4194E-02	2.3546E 00	3.7151E 04	6.6490E-01
1.2898E-02	8.8988E 00	1.7319E 03	1.8245E 01	4.2839E-02	2.5264E 00	4.6543E 04	6.7216E-01
1.4633E-02	8.3094E 00	1.9649E 03	1.8835E 01	4.8602E-02	2.3912E 00	5.2804E 04	6.9388E-01
1.8681E-02	7.9365E 00	2.5085E 03	1.9208E 01	6.2049E-02	2.5000E 00	6.7414E 04	7.0762E-01
2.2151E-02	7.7531E 00	2.9745E 03	1.9391E 01	7.3575E-02	2.6128E 00	7.9937E 04	7.1437E-01
2.4465E-02	7.6321E 00	3.2851E 03	1.9512E 01	8.1259E-02	2.6717E 00	8.8286E 04	7.1883E-01
2.7935E-02	7.2156E 00	3.7511E 03	1.9929E 01	9.2785E-02	2.6273E 00	1.0081E 05	7.3418E-01
3.0248E-02	7.1571E 00	4.0618E 03	1.9987E 01	1.0047E-01	2.6929E 00	1.0916E 05	7.3633E-01
3.3140E-02	7.2746E 00	4.4501E 03	1.9870E 01	1.1007E-01	2.8573E 00	1.1959E 05	7.3200E-01
3.6610E-02	7.0403E 00	4.9160E 03	2.0104E 01	1.2160E-01	2.8616E 00	1.3212E 05	7.4063E-01
4.1816E-02	6.3571E 00	5.6150E 03	2.0787E 01	1.3889E-01	2.6885E 00	1.5090E 05	7.6580E-01
4.4708E-02	5.0477E 00	6.0033E 03	2.2097E 01	1.4849E-01	2.1350E 00	1.6134E 05	8.1404E-01
4.8178E-02	6.0476E 00	6.4693E 03	2.1097E 01	1.6002E-01	2.7058E 00	1.7386E 05	7.7720E-01
5.0491E-02	6.0476E 00	6.7799E 03	2.1097E 01	1.6770E-01	2.7611E 00	1.8221E 05	7.7720E-01
5.3961E-02	5.7973E 00	7.2459E 03	2.1347E 01	1.7923E-01	2.7184E 00	1.9473E 05	7.8643E-01
5.6275E-02	5.4133E 00	7.5566E 03	2.1731E 01	1.8692E-01	2.5824E 00	2.0308E 05	8.0057E-01
5.9745E-02	5.2557E 00	8.0225E 03	2.1888E 01	1.9844E-01	2.5768E 00	2.1560E 05	8.0638E-01
6.5529E-02	5.2036E 00	8.7992E 03	2.1941E 01	2.1765E-01	2.6602E 00	2.3647E 05	8.0830E-01
7.0734E-02	4.9446E 00	9.4981E 03	2.2200E 01	2.3494E-01	2.6251E 00	2.5526E 05	8.1784E-01
7.6518E-02	4.5688E 00	1.0275E 04	2.2575E 01	2.5415E-01	2.5360E 00	2.7613E 05	8.3169E-01
8.2301E-02	4.2403E 00	1.1051E 04	2.2904E 01	2.7336E-01	2.4630E 00	2.9700E 05	8.4379E-01
8.8085E-02	4.2403E 00	1.1828E 04	2.2904E 01	2.9257E-01	2.5428E 00	3.1787E 05	8.4378E-01
1.0254E-01	3.8503E 00	1.3770E 04	2.3294E 01	3.4060E-01	2.5329E 00	3.7005E 05	8.5815E-01
1.1700E-01	3.6884E 00	1.5711E 04	2.3486E 01	3.8862E-01	2.5950E 00	4.2223E 05	8.6522E-01
1.3146E-01	2.7570E 00	1.7653E 04	2.4387E 01	4.3665E-01	2.2964E 00	4.7441E 05	8.9843E-01
1.4592E-01	2.2660E 00	1.9594E 04	2.4878E 01	4.8467E-01	2.1816E 00	5.2658E 05	9.1652E-01
1.5980E-01	1.8747E 00	2.1458E 04	2.5269E 01	5.3078E-01	2.0991E 00	5.7667E 05	9.3094E-01
1.7484E-01	1.3672E 00	2.3477E 04	2.5777E 01	5.8072E-01	1.9594E 00	6.3094E 05	9.4963E-01
1.8988E-01	1.3257E 00	2.5497E 04	2.5819E 01	6.3067E-01	2.0359E 00	6.8521E 05	9.5116E-01
2.0376E-01	1.0785E 00	2.7361E 04	2.6066E 01	6.7677E-01	1.9991E 00	7.3530E 05	9.6027E-01
2.1880E-01	8.2722E-01	2.9380E 04	2.6317E 01	7.2672E-01	1.9610E 00	7.8956E 05	9.6952E-01
2.3325E-01	6.5946E-01	3.1321E 04	2.6485E 01	7.7475E-01	1.9548E 00	8.4174E 05	9.7571E-01
2.4714E-01	4.2324E-01	3.3185E 04	2.6721E 01	8.2085E-01	1.9083E 00	8.9183E 05	9.8441E-01
2.6159E-01	3.4528E-01	3.5127E 04	2.6799E 01	8.6888E-01	1.9371E 00	9.4401E 05	9.8728E-01
2.9109E-01	1.9076E-01	3.9088E 04	2.6953E 01	9.6685E-01	1.9872E 00	1.0505E 06	9.9297E-01
3.0497E-01	1.1422E-01	4.0951E 04	2.7030E 01	1.0130E 00	2.0046E 00	1.1005E 06	9.9579E-01
3.1943E-01	7.6214E-02	4.2893E 04	2.7068E 01	1.0610E 00	2.0403E 00	1.1527E 06	9.9719E-01
3.3389E-01	3.8076E-02	4.4835E 04	2.7106E 01	1.1090E 00	2.0736E 00	1.2049E 06	9.9860E-01
3.4835E-01	2.5887E-04	4.6776E 04	2.7144E 01	1.1570E 00	2.1048E 00	1.2571E 06	9.9999E-01
3.6281E-01	1.6179E-06	4.8718E 04	2.7144E 01	1.2051E 00	2.1521E 00	1.3093E 06	1.0000E 00

PI FOR COLES WAKE FUNCTION = -2.0035E 00

RUN NUMBER 76- 28

THIS DATA REDUCTION SHOT IS FOR AN ADIABATIC WALL

RECOVERY FACTOR = 0.8800

PRANDTL NUMBER = 0.8090

GAMMA = 1.4000

FREE-STREAM UNIT REYNOLDS NO. PER METER= 9.7359E 06

DELTA(CM) = 1.2640E 00

DELTA STAR(CM) = 1.7390E-01 DELTA STAR(CM) NEW = 1.7379E-01

THETA(CM) = 1.2283E-01 THETA(CM) NEW = 1.2315E-01

SHAPE FACTOR = 1.4158E 00 NEW SHAPE FACTOR = 1.4113E 00

SKIN FRICTION = 2.5000E-03

Y	PT2	TO/TOE	M	U/UE	T/TE	TBAR	RHO/RHOE	RHO*U/(RHOE*UE)
0.0	8.43002E-01	9.94284E-01	0.0	0.0	1.04400E 00	0.0	9.57850E-01	0.0
5.84200E-03	8.80800E-01	9.96666E-01	2.51102E-01	5.10505E-01	1.03347E 00	4.16653E-01	9.67611E-01	4.93970E-01
1.85420E-02	8.93900E-01	9.97467E-01	2.90607E-01	5.89814E-01	1.02995E 00	5.56809E-01	9.70921E-01	5.72662E-01
3.12420E-02	8.99400E-01	9.97800E-01	3.05564E-01	6.19730E-01	1.02849E 00	6.15128E-01	9.72298E-01	6.02562E-01
4.39420E-02	9.01400E-01	9.97921E-01	3.10817E-01	6.30222E-01	1.02796E 00	6.36262E-01	9.72799E-01	6.13079E-01
5.91820E-02	9.08500E-01	9.98346E-01	3.28697E-01	6.65871E-01	1.02610E 00	7.10631E-01	9.74566E-01	6.48936E-01
8.45820E-02	9.11500E-01	9.98525E-01	3.35943E-01	6.80290E-01	1.02531E 00	7.41935E-01	9.75311E-01	6.63494E-01
1.07442E-01	9.17500E-01	9.98878E-01	3.49931E-01	7.08078E-01	1.02376E 00	8.03750E-01	9.76795E-01	6.91647E-01
1.32842E-01	9.21000E-01	9.99084E-01	3.57807E-01	7.23695E-01	1.02285E 00	8.39663E-01	9.77657E-01	7.07526E-01
1.58242E-01	9.24500E-01	9.99285E-01	3.65494E-01	7.38917E-01	1.02195E 00	8.74940E-01	9.78519E-01	7.23045E-01
1.86182E-01	9.27600E-01	9.99464E-01	3.72153E-01	7.52086E-01	1.02116E 00	9.06245E-01	9.79280E-01	7.36503E-01
2.11582E-01	9.28600E-01	9.99520E-01	3.74273E-01	7.56277E-01	1.02090E 00	9.15938E-01	9.79527E-01	7.40793E-01
2.34442E-01	9.32100E-01	9.99718E-01	3.81585E-01	7.70713E-01	1.02001E 00	9.50739E-01	9.80385E-01	7.55596E-01
2.59842E-01	9.35600E-01	9.99913E-01	3.88741E-01	7.84822E-01	1.01911E 00	9.84745E-01	9.81245E-01	7.70103E-01
2.85242E-01	9.36600E-01	9.99967E-01	3.90759E-01	7.88798E-01	1.01886E 00	9.94279E-01	9.81491E-01	7.74198E-01
3.10642E-01	9.39100E-01	1.00010E 00	3.95755E-01	7.98633E-01	1.01822E 00	1.01812E 00	9.82106E-01	7.84342E-01
3.36042E-01	9.44200E-01	1.00037E 00	4.05715E-01	8.18207E-01	1.01692E 00	1.06483E 00	9.83363E-01	8.04595E-01
3.61442E-01	9.46200E-01	1.00047E 00	4.09546E-01	8.25725E-01	1.01641E 00	1.08231E 00	9.83860E-01	8.12398E-01
3.86842E-01	9.49200E-01	1.00062E 00	4.15217E-01	8.36844E-01	1.01564E 00	1.10822E 00	9.84605E-01	8.23961E-01
4.14782E-01	9.50700E-01	1.00069E 00	4.18016E-01	8.42323E-01	1.01525E 00	1.12061E 00	9.84979E-01	8.29671E-01
4.40182E-01	9.51700E-01	1.00074E 00	4.19871E-01	8.45954E-01	1.01499E 00	1.12871E 00	9.85230E-01	8.33459E-01
4.65582E-01	9.54200E-01	1.00085E 00	4.24468E-01	8.54944E-01	1.01434E 00	1.14810E 00	9.85859E-01	8.42854E-01
4.90982E-01	9.56200E-01	1.00093E 00	4.28103E-01	8.62044E-01	1.01382E 00	1.16288E 00	9.86366E-01	8.50291E-01
5.13842E-01	9.59300E-01	1.00105E 00	4.33670E-01	8.72903E-01	1.01301E 00	1.18417E 00	9.87159E-01	8.61694E-01
5.77342E-01	9.60800E-01	1.00111E 00	4.36334E-01	8.78092E-01	1.01261E 00	1.19371E 00	9.87546E-01	8.67156E-01
6.40842E-01	9.69800E-01	1.00135E 00	4.51923E-01	9.08365E-01	1.01016E 00	1.23613E 00	9.89941E-01	8.99227E-01
7.04342E-01	9.72800E-01	1.00139E 00	4.56975E-01	9.18133E-01	1.00931E 00	1.24329E 00	9.90773E-01	9.09661E-01
7.67842E-01	9.76900E-01	1.00140E 00	4.63775E-01	9.31242E-01	1.00811E 00	1.24583E 00	9.91950E-01	9.23745E-01
8.31342E-01	9.81400E-01	1.00135E 00	4.71109E-01	9.45324E-01	1.00674E 00	1.23677E 00	9.93305E-01	9.38995E-01
8.94842E-01	9.84400E-01	1.00127E 00	4.75918E-01	9.54517E-01	1.00578E 00	1.22247E 00	9.94253E-01	9.49031E-01
9.58342E-01	9.87900E-01	1.00112E 00	4.81456E-01	9.65064E-01	1.00461E 00	1.19609E 00	9.95412E-01	9.60636E-01
1.02438E 00	9.92000E-01	1.00086E 00	4.87847E-01	9.77165E-01	1.00316E 00	1.14969E 00	9.96854E-01	9.74091E-01
1.08534E 00	9.94500E-01	1.00064E 00	4.91692E-01	9.84408E-01	1.00222E 00	1.11203E 00	9.97786E-01	9.82228E-01
1.15138E 00	9.96000E-01	1.00049E 00	4.93985E-01	9.88711E-01	1.00164E 00	1.08565E 00	9.98366E-01	9.87096E-01
1.21234E 00	9.97000E-01	1.00038E 00	4.95503E-01	9.91552E-01	1.00124E 00	1.06642E 00	9.98762E-01	9.90324E-01
1.27584E 00	9.98500E-01	1.00020E 00	4.97774E-01	9.95793E-01	1.00063E 00	1.03480E 00	9.99372E-01	9.95167E-01
1.33934E 00	9.99000E-01	1.00013E 00	4.98526E-01	9.97192E-01	1.00042E 00	1.02368E 00	9.99578E-01	9.96771E-01
1.40538E 00	9.99500E-01	1.00007E 00	4.99281E-01	9.98597E-01	1.00021E 00	1.01192E 00	9.99788E-01	9.98386E-01
1.46888E 00	1.00000E 00	1.00000E 00	5.00030E-01	9.99990E-01	1.00000E 00	1.00000E 00	9.99999E-01	9.99990E-01
1.52984E 00	1.00000E 00	1.00000E 00	5.00030E-01	9.99990E-01	1.00000E 00	1.00000E 00	9.99999E-01	9.99990E-01
1.59334E 00	1.00000E 00	1.00000E 00	5.00035E-01	1.00000E 00	1.00000E 00	1.00000E 00	1.00000E 00	1.00000E 00

THE DATA

Y*US/DS	VEL DEF	Y+	U+	Y/D	C. WAKE	REY	U/U1
0.0	2.7682E 01	0.0	0.0	0.0	0.0	0.0	0.0
1.2143E-03	1.3550E 01	1.7294E 02	1.4132E 01	4.6219E-03	2.1415E 00	4.7398E 03	5.1050E-01
3.8541E-03	1.1355E 01	5.4890E 02	1.6327E 01	1.4670E-02	2.5231E 00	1.5044E 04	5.8981E-01
6.4940E-03	1.0527E 01	9.2487E 02	1.7155E 01	2.4717E-02	2.7888E 00	2.5347E 04	6.1973E-01
9.1338E-03	1.0236E 01	1.3008E 03	1.7446E 01	3.4765E-02	3.1080E 00	3.5651E 04	6.3022E-01
1.2302E-02	9.2493E 00	1.7520E 03	1.8432E 01	4.6822E-02	2.9590E 00	4.8016E 04	6.6587E-01
1.7581E-02	8.8501E 00	2.5039E 03	1.8832E 01	6.6918E-02	3.2366E 00	6.8624E 04	6.8029E-01
2.2333E-02	8.0809E 00	3.1806E 03	1.9601E 01	8.5003E-02	3.1298E 00	8.7171E 04	7.0808E-01
2.7613E-02	7.6486E 00	3.9326E 03	2.0033E 01	1.0510E-01	3.1805E 00	1.0778E 05	7.2370E-01
3.2892E-02	7.2272E 00	4.6845E 03	2.0455E 01	1.2519E-01	3.1842E 00	1.2839E 05	7.3892E-01
3.8700E-02	6.8627E 00	5.5116E 03	2.0819E 01	1.4730E-01	3.2033E 00	1.5105E 05	7.5209E-01
4.3980E-02	6.7467E 00	6.2635E 03	2.0935E 01	1.6739E-01	3.3177E 00	1.7166E 05	7.5628E-01
4.8731E-02	6.3471E 00	6.9403E 03	2.1335E 01	1.8548E-01	3.2308E 00	1.9021E 05	7.7071E-01
5.4011E-02	5.9565E 00	7.6922E 03	2.1725E 01	2.0558E-01	3.1494E 00	2.1082E 05	7.8482E-01
5.9291E-02	5.8464E 00	8.4441E 03	2.1835E 01	2.2567E-01	3.2178E 00	2.3142E 05	7.8880E-01
6.4570E-02	5.5742E 00	9.1960E 03	2.2108E 01	2.4577E-01	3.1804E 00	2.5203E 05	7.9863E-01
6.9850E-02	5.0323E 00	9.9480E 03	2.2649E 01	2.6586E-01	2.9763E 00	2.7264E 05	8.1821E-01
7.5129E-02	4.8242E 00	1.0700E 04	2.2858E 01	2.8596E-01	2.9585E 00	2.9325E 05	8.2573E-01
8.0409E-02	4.5165E 00	1.1452E 04	2.3165E 01	3.0605E-01	2.8755E 00	3.1386E 05	8.3684E-01
8.6217E-02	4.3648E 00	1.2279E 04	2.3317E 01	3.2816E-01	2.8861E 00	3.3652E 05	8.4232E-01
9.1496E-02	4.2643E 00	1.3031E 04	2.3418E 01	3.4825E-01	2.9118E 00	3.5713E 05	8.4595E-01
9.6776E-02	4.0154E 00	1.3783E 04	2.3666E 01	3.6835E-01	2.8463E 00	3.7774E 05	8.5494E-01
1.0206E-01	3.8189E 00	1.4535E 04	2.3863E 01	3.8844E-01	2.8071E 00	3.9835E 05	8.6204E-01
1.0681E-01	3.5183E 00	1.5211E 04	2.4163E 01	4.0653E-01	2.6965E 00	4.1689E 05	8.7290E-01
1.2001E-01	3.3746E 00	1.7091E 04	2.4307E 01	4.5677E-01	2.7778E 00	4.6841E 05	8.7809E-01
1.3321E-01	2.5366E 00	1.8971E 04	2.5145E 01	5.0701E-01	2.4374E 00	5.1993E 05	9.0836E-01
1.4640E-01	2.2662E 00	2.0851E 04	2.5416E 01	5.5725E-01	2.4135E 00	5.7145E 05	9.1813E-01
1.5960E-01	1.9034E 00	2.2731E 04	2.5778E 01	6.0748E-01	2.3242E 00	6.2297E 05	9.3124E-01
1.7280E-01	1.5135E 00	2.4610E 04	2.6168E 01	6.5772E-01	2.2095E 00	6.7449E 05	9.4532E-01
1.8600E-01	1.2590E 00	2.6490E 04	2.6423E 01	7.0796E-01	2.1652E 00	7.2601E 05	9.5452E-01
1.9920E-01	9.6710E-01	2.8370E 04	2.6715E 01	7.5820E-01	2.0920E 00	7.7753E 05	9.6506E-01
2.1293E-01	6.3212E-01	3.0325E 04	2.7050E 01	8.1045E-01	1.9910E 00	8.3111E 05	9.7716E-01
2.2560E-01	4.3162E-01	3.2130E 04	2.7250E 01	8.5868E-01	1.9558E 00	8.8057E 05	9.8441E-01
2.3933E-01	3.1250E-01	3.4085E 04	2.7369E 01	9.1092E-01	1.9698E 00	9.3415E 05	9.8871E-01
2.5200E-01	2.3385E-01	3.5889E 04	2.7448E 01	9.5915E-01	1.9968E 00	9.8360E 05	9.9155E-01
2.6520E-01	1.1647E-01	3.7769E 04	2.7565E 01	1.0094E 00	2.0004E 00	1.0351E 06	9.9579E-01
2.7840E-01	7.7723E-02	3.9649E 04	2.7604E 01	1.0596E 00	2.0463E 00	1.0866E 06	9.9719E-01
2.9212E-01	3.9830E-02	4.1604E 04	2.7643E 01	1.1119E 00	2.0915E 00	1.1402E 06	9.9860E-01
3.0532E-01	2.6359E-04	4.3484E 04	2.7682E 01	1.1621E 00	2.1314E 00	1.1917E 06	9.9999E-01
3.1799E-01	2.6359E-04	4.5288E 04	2.7682E 01	1.2103E 00	2.1887E 00	1.2412E 06	9.9999E-01
3.3119E-01	1.5500E-06	4.7168E 04	2.7682E 01	1.2606E 00	2.2458E 00	1.2927E 06	1.0000E 00

PI FOR COLES WAKE FUNCTION = -1.6474E 00

RUN NUMBER 76- 29

THIS DATA REDUCTION SHOT IS FOR AN ADIABATIC WALL

RECOVERY FACTOR = 0.8800

PRANDTL NUMBER = 0.8090

GAMMA = 1.4000

FREE-STREAM UNIT REYNOLDS NO. PER METER= 9.7977E 06

DELTA(CM) = 1.1328E 00

DELTA STAR(CM) = 9.8751E-02 DELTA STAR(CM) NEW = 9.8555E-02

THETA(CM) = 6.9977E-02 THETA(CM) NEW = 7.0365E-02

SHAPE FACTOR = 1.4112E 00 NEW SHAPE FACTOR = 1.4006E 00

SKIN FRICTION = 2.9000E-03

Y	PT2	TO/TOE	M	U/UE	T/TE	TBAR	RHO/RHOE	RHO*U/(RHOE*UE)
0.0	8.43002E-01	9.94284E-01	0.0	0.0	1.04400E 00	0.0	9.57850E-01	0.0
5.84200E-03	8.86500E-01	9.97015E-01	2.69060E-01	5.46607E-01	1.03193E 00	4.77832E-01	9.69056E-01	5.29693E-01
1.85420E-02	8.95100E-01	9.97540E-01	2.93944E-01	5.96492E-01	1.02963E 00	5.69681E-01	9.71221E-01	5.79326E-01
3.12420E-02	9.07200E-01	9.98269E-01	3.25505E-01	6.59513E-01	1.02644E 00	6.97124E-01	9.74243E-01	6.42526E-01
4.39420E-02	9.08700E-01	9.98358E-01	3.29190E-01	6.66852E-01	1.02604E 00	7.12697E-01	9.74616E-01	6.49925E-01
6.17220E-02	9.13200E-01	9.98625E-01	3.39971E-01	6.88299E-01	1.02487E 00	7.59415E-01	9.75732E-01	6.71595E-01
8.20420E-02	9.21300E-01	9.99101E-01	3.58473E-01	7.25015E-01	1.02278E 00	8.42682E-01	9.77731E-01	7.08869E-01
1.07442E-01	9.34400E-01	9.99846E-01	3.86304E-01	7.80021E-01	1.01942E 00	9.73145E-01	9.80950E-01	7.65161E-01
1.37922E-01	9.38400E-01	1.00006E 00	3.94361E-01	7.95890E-01	1.01840E 00	1.01144E 00	9.81934E-01	7.81511E-01
1.58242E-01	9.45000E-01	1.00041E 00	4.07251E-01	8.21224E-01	1.01671E 00	1.07198E 00	9.83562E-01	8.07725E-01
1.83642E-01	9.47500E-01	1.00054E 00	4.12012E-01	8.30563E-01	1.01607E 00	1.09375E 00	9.84182E-01	8.17425E-01
2.09042E-01	9.51100E-01	1.00071E 00	4.18762E-01	8.43785E-01	1.01515E 00	1.12363E 00	9.85081E-01	8.31196E-01
2.36982E-01	9.57100E-01	1.00097E 00	4.29732E-01	8.65224E-01	1.01359E 00	1.16939E 00	9.86595E-01	8.53625E-01
2.59842E-01	9.62200E-01	1.00115E 00	4.38802E-01	8.82897E-01	1.01224E 00	1.20197E 00	9.87910E-01	8.72223E-01
2.85242E-01	9.64200E-01	1.00122E 00	4.42298E-01	8.89694E-01	1.01170E 00	1.21278E 00	9.88435E-01	8.79405E-01
3.10642E-01	9.66200E-01	1.00127E 00	4.45761E-01	8.96420E-01	1.01116E 00	1.22247E 00	9.88965E-01	8.86528E-01
3.36042E-01	9.67200E-01	1.00130E 00	4.47485E-01	8.99765E-01	1.01088E 00	1.22676E 00	9.89234E-01	8.90078E-01
3.86842E-01	9.74800E-01	1.00140E 00	4.60307E-01	9.24563E-01	1.00873E 00	1.24567E 00	9.91342E-01	9.16558E-01
4.12242E-01	9.76300E-01	1.00141E 00	4.62792E-01	9.29349E-01	1.00829E 00	1.24599E 00	9.91776E-01	9.21706E-01
4.37642E-01	9.78800E-01	1.00139E 00	4.66890E-01	9.37230E-01	1.00754E 00	1.24376E 00	9.92513E-01	9.30213E-01
4.68122E-01	9.80300E-01	1.00137E 00	4.69330E-01	9.41913E-01	1.00708E 00	1.24027E 00	9.92968E-01	9.35289E-01
4.88442E-01	9.84400E-01	1.00127E 00	4.75918E-01	9.54517E-01	1.00578E 00	1.22247E 00	9.94253E-01	9.49031E-01
2.59842E-01	9.85400E-01	1.00124E 00	4.77508E-01	9.57550E-01	1.00545E 00	1.21611E 00	9.94577E-01	9.52358E-01
5.77342E-01	9.88900E-01	1.00107E 00	4.83024E-01	9.68038E-01	1.00426E 00	1.18640E 00	9.95754E-01	9.63928E-01
6.40842E-01	9.91400E-01	1.00090E 00	4.86917E-01	9.75409E-01	1.00338E 00	1.15779E 00	9.96635E-01	9.72127E-01
7.04342E-01	9.94500E-01	1.00064E 00	4.91692E-01	9.84408E-01	1.00222E 00	1.11203E 00	9.97786E-01	9.82228E-01
7.72922E-01	9.95500E-01	1.00054E 00	4.93222E-01	9.87280E-01	1.00183E 00	1.09487E 00	9.98170E-01	9.85473E-01
8.31342E-01	9.95500E-01	1.00054E 00	4.93222E-01	9.87280E-01	1.00183E 00	1.09487E 00	9.98170E-01	9.85473E-01
8.99922E-01	9.95500E-01	1.00054E 00	4.93222E-01	9.87280E-01	1.00183E 00	1.09487E 00	9.98170E-01	9.85473E-01
1.02438E 00	9.96000E-01	1.00049E 00	4.93985E-01	9.88710E-01	1.00164E 00	1.08565E 00	9.98366E-01	9.87095E-01
1.08534E 00	9.97500E-01	1.00032E 00	4.96263E-01	9.92972E-01	1.00104E 00	1.05625E 00	9.98963E-01	9.91943E-01
1.15138E 00	9.98500E-01	1.00020E 00	4.97774E-01	9.95792E-01	1.00063E 00	1.03480E 00	9.99372E-01	9.95167E-01
1.21488E 00	9.99500E-01	1.00007E 00	4.99281E-01	9.98598E-01	1.00021E 00	1.01208E 00	9.99788E-01	9.98386E-01
1.27838E 00	1.00000E 00	1.00000E 00	5.00030E-01	9.99990E-01	1.00000E 00	1.00000E 00	9.99999E-01	9.99990E-01
1.33934E 00	1.00000E 00	1.00000E 00	5.00030E-01	9.99990E-01	1.00000E 00	1.00000E 00	9.99999E-01	9.99990E-01
1.40284E 00	1.00000E 00	1.00000E 00	5.00030E-01	9.99990E-01	1.00000E 00	1.00000E 00	9.99999E-01	9.99990E-01
1.46634E 00	1.00000E 00	1.00000E 00	5.00030E-01	9.99990E-01	1.00000E 00	1.00000E 00	9.99999E-01	9.99990E-01
1.52984E 00	1.00000E 00	1.00000E 00	5.00030E-01	9.99990E-01	1.00000E 00	1.00000E 00	9.99999E-01	9.99990E-01
1.59334E 00	1.00000E 00	1.00000E 00	5.00035E-01	1.00000E 00	1.00000E 00	1.00000E 00	1.00000E 00	1.00000E 00

THE DATA

Y*US/DS	VEL DEF	Y+	U+	Y/D	C. WAKE	REY	U/U1
0.0	2.5702E 01	0.0	0.0	0.0	0.0	0.0	0.0
2.3063E-03	1.1653E 01	1.8745E 02	1.4049E 01	5.1570E-03	1.4948E 00	4.7699E 03	5.4661E-01
7.3200E-03	1.0371E 01	5.9494E 02	1.5331E 01	1.6368E-02	2.0862E 00	1.5139E 04	5.9649E-01
1.2334E-02	8.7512E 00	1.0024E 03	1.6951E 01	2.7579E-02	1.9579E 00	2.5508E 04	6.5951E-01
1.7347E-02	8.5625E 00	1.4099E 03	1.7139E 01	3.8790E-02	2.2030E 00	3.5878E 04	6.6685E-01
2.4367E-02	8.0113E 00	1.9804E 03	1.7691E 01	5.4485E-02	2.3091E 00	5.0395E 04	6.8830E-01
3.2389E-02	7.0676E 00	2.6324E 03	1.8634E 01	7.2422E-02	2.2152E 00	6.6985E 04	7.2501E-01
4.2416E-02	5.6539E 00	3.4474E 03	2.0048E 01	9.4844E-02	1.9292E 00	8.7724E 04	7.8002E-01
5.4449E-02	5.2460E 00	4.4254E 03	2.0456E 01	1.2175E-01	2.0053E 00	1.1261E 05	7.9589E-01
6.2471E-02	4.5949E 00	5.0774E 03	2.1107E 01	1.3969E-01	1.8855E 00	1.2920E 05	8.2122E-01
7.2498E-02	4.3549E 00	5.8924E 03	2.1347E 01	1.6211E-01	1.9318E 00	1.4994E 05	8.3056E-01
8.2525E-02	4.0150E 00	6.7074E 03	2.1687E 01	1.8453E-01	1.9225E 00	1.7068E 05	8.4378E-01
9.3556E-02	3.4640E 00	7.6038E 03	2.2238E 01	2.0919E-01	1.8293E 00	1.9349E 05	8.6522E-01
1.0258E-01	3.0098E 00	8.3373E 03	2.2692E 01	2.2937E-01	1.7421E 00	2.1216E 05	8.8290E-01
1.1261E-01	2.8351E 00	9.1523E 03	2.2867E 01	2.5180E-01	1.7617E 00	2.3289E 05	8.8969E-01
1.2264E-01	2.6622E 00	9.9673E 03	2.3040E 01	2.7422E-01	1.7746E 00	2.5363E 05	8.9642E-01
1.3266E-01	2.5762E 00	1.0782E 04	2.3126E 01	2.9664E-01	1.8143E 00	2.7437E 05	8.9977E-01
1.5272E-01	1.9389E 00	1.2412E 04	2.3763E 01	3.4148E-01	1.7022E 00	3.1585E 05	9.2456E-01
1.6274E-01	1.8159E 00	1.3227E 04	2.3886E 01	3.6390E-01	1.7140E 00	3.3659E 05	9.2935E-01
1.7277E-01	1.6133E 00	1.4042E 04	2.4089E 01	3.8633E-01	1.6921E 00	3.5732E 05	9.3723E-01
1.8480E-01	1.4930E 00	1.5020E 04	2.4209E 01	4.1323E-01	1.7083E 00	3.8221E 05	9.4191E-01
1.9283E-01	1.1690E 00	1.5672E 04	2.4533E 01	4.3117E-01	1.6246E 00	3.9880E 05	9.5452E-01
1.0258E-01	1.0910E 00	8.3373E 03	2.4611E 01	2.2937E-01	1.0157E 00	2.1216E 05	9.5755E-01
2.2792E-01	8.2148E-01	1.8525E 04	2.4880E 01	5.0965E-01	1.6463E 00	4.7139E 05	9.6804E-01
2.5299E-01	6.3204E-01	2.0562E 04	2.5070E 01	5.6570E-01	1.6701E 00	5.2323E 05	9.7541E-01
2.7806E-01	4.0074E-01	2.2600E 04	2.5301E 01	6.2175E-01	1.6689E 00	5.7508E 05	9.8441E-01
3.0513E-01	3.2693E-01	2.4800E 04	2.5375E 01	6.8229E-01	1.7260E 00	6.3107E 05	9.8728E-01
3.2820E-01	3.2693E-01	2.6675E 04	2.5375E 01	7.3386E-01	1.7926E 00	6.7877E 05	9.8728E-01
3.5527E-01	3.2693E-01	2.8875E 04	2.5375E 01	7.9440E-01	1.8650E 00	7.3477E 05	9.8728E-01
4.0440E-01	2.9017E-01	3.2869E 04	2.5412E 01	9.0427E-01	1.9694E 00	8.3638E 05	9.8871E-01
4.2847E-01	1.8063E-01	3.4824E 04	2.5521E 01	9.5808E-01	1.9807E 00	8.8616E 05	9.9297E-01
4.5454E-01	1.0815E-01	3.6943E 04	2.5594E 01	1.0164E 00	2.0071E 00	9.4008E 05	9.9579E-01
4.7961E-01	3.6041E-02	3.8981E 04	2.5666E 01	1.0724E 00	2.0288E 00	9.9192E 05	9.9860E-01
5.0468E-01	2.4511E-04	4.1018E 04	2.5702E 01	1.1285E 00	2.0617E 00	1.0438E 06	9.9999E-01
5.2874E-01	2.4511E-04	4.2974E 04	2.5702E 01	1.1823E 00	2.1041E 00	1.0935E 06	9.9999E-01
5.5381E-01	2.4511E-04	4.5012E 04	2.5702E 01	1.2384E 00	2.1464E 00	1.1454E 06	9.9999E-01
5.7888E-01	2.4511E-04	4.7049E 04	2.5702E 01	1.2944E 00	2.1867E 00	1.1972E 06	9.9999E-01
6.0395E-01	2.4511E-04	4.9087E 04	2.5702E 01	1.3505E 00	2.2253E 00	1.2491E 06	9.9999E-01
6.2902E-01	1.5320E-06	5.1124E 04	2.5702E 01	1.4065E 00	2.2622E 00	1.3009E 06	1.0000E 00

PI FOR COLES WAKE FUNCTION = -2.5772E 00

RUN NUMBER 76- 33

THIS DATA REDUCTION SHOT IS FOR AN ADIABATIC WALL

RECOVERY FACTOR = 0.8800

PRANDTL NUMBER = 0.8090

GAMMA = 1.4000

FREE-STREAM UNIT REYNOLDS NO. PER METER= 9.6330E 06

DELTA(CM) = 1.5134E 00

DELTA STAR(CM) = 2.2095E-01 DELTA STAR(CM) NEW = 2.2080E-01

THETA(CM) = 1.5400E-01 THETA(CM) NEW = 1.5429E-01

SHAPE FACTOR = 1.4347E 00 NEW SHAPE FACTOR = 1.4311E 00

SKIN FRICTION = 2.3000E-03

Y	PT2	TO/TOE	M	U/UE	T/TE	TBAR	RHO/RHOE	RHO*U/(RHOE*UE)
0.0	8.43002E-01	9.94284E-01	0.0	0.0	1.04400E 00	0.0	9.57850E-01	0.0
5.84200E-03	8.72900E-01	9.96176E-01	2.23684E-01	4.55236E-01	1.03563E 00	3.31003E-01	9.65597E-01	4.39575E-01
1.85420E-02	8.83400E-01	9.96826E-01	2.59461E-01	5.27319E-01	1.03277E 00	4.44621E-01	9.68271E-01	5.10587E-01
3.12420E-02	8.90500E-01	9.97261E-01	2.80930E-01	5.70423E-01	1.03086E 00	5.20737E-01	9.70065E-01	5.53347E-01
4.64820E-02	8.95500E-01	9.97563E-01	2.95045E-01	5.98696E-01	1.02952E 00	5.73653E-01	9.71323E-01	5.81527E-01
5.66420E-02	8.98500E-01	9.97746E-01	3.03175E-01	6.14956E-01	1.02873E 00	6.05594E-01	9.72074E-01	5.97782E-01
7.18819E-02	9.02000E-01	9.97956E-01	3.12370E-01	6.33322E-01	1.02780E 00	6.42460E-01	9.72949E-01	6.16190E-01
8.20420E-02	9.05000E-01	9.98137E-01	3.20024E-01	6.48590E-01	1.02701E 00	6.74082E-01	9.73697E-01	6.31530E-01
1.07442E-01	9.09500E-01	9.98406E-01	3.31133E-01	6.70719E-01	1.02584E 00	7.21119E-01	9.74815E-01	6.53827E-01
1.32842E-01	9.13600E-01	9.98648E-01	3.40910E-01	6.90164E-01	1.02477E 00	7.63547E-01	9.75831E-01	6.73483E-01
1.58242E-01	9.16100E-01	9.98797E-01	3.46721E-01	7.01706E-01	1.02412E 00	7.89449E-01	9.76449E-01	6.85180E-01
1.83642E-01	9.20600E-01	9.99060E-01	3.56913E-01	7.21924E-01	1.02296E 00	8.35532E-01	9.77558E-01	7.05723E-01
2.09042E-01	9.23600E-01	9.99234E-01	3.63539E-01	7.35047E-01	1.02218E 00	8.66042E-01	9.78297E-01	7.19094E-01
2.36982E-01	9.21600E-01	9.99118E-01	3.59138E-01	7.26331E-01	1.02270E 00	8.45702E-01	9.77804E-01	7.10210E-01
2.59842E-01	9.28600E-01	9.99520E-01	3.74273E-01	7.56277E-01	1.02090E 00	9.15938E-01	9.79527E-01	7.40794E-01
2.85242E-01	9.32200E-01	9.99724E-01	3.81791E-01	7.71120E-01	1.01998E 00	9.51692E-01	9.80410E-01	7.56014E-01
3.10642E-01	9.34700E-01	9.99863E-01	3.86921E-01	7.81236E-01	1.01934E 00	9.76005E-01	9.81026E-01	7.66413E-01
3.36042E-01	9.35700E-01	9.99918E-01	3.88943E-01	7.85221E-01	1.01909E 00	9.85698E-01	9.81270E-01	7.70513E-01
3.61442E-01	9.39200E-01	1.00011E 00	3.95948E-01	7.99012E-01	1.01819E 00	1.01891E 00	9.82131E-01	7.84734E-01
3.86842E-01	9.41200E-01	1.00021E 00	3.99890E-01	8.06765E-01	1.01768E 00	1.03734E 00	9.82624E-01	7.92747E-01
4.52882E-01	9.45700E-01	1.00045E 00	4.08596E-01	8.23862E-01	1.01653E 00	1.07818E 00	9.83735E-01	8.10462E-01
5.13842E-01	9.48200E-01	1.00057E 00	4.13335E-01	8.33156E-01	1.01589E 00	1.09979E 00	9.84356E-01	8.20122E-01
5.77342E-01	9.49200E-01	1.00062E 00	4.15217E-01	8.36843E-01	1.01564E 00	1.10822E 00	9.84605E-01	8.23960E-01
6.40842E-01	9.58300E-01	1.00101E 00	4.31885E-01	8.69424E-01	1.01327E 00	1.17766E 00	9.86902E-01	8.58035E-01
7.04342E-01	9.63800E-01	1.00120E 00	4.41602E-01	8.88342E-01	1.01181E 00	1.21087E 00	9.88328E-01	8.77974E-01
7.67842E-01	9.66800E-01	1.00129E 00	4.46798E-01	8.98431E-01	1.01099E 00	1.22517E 00	9.89127E-01	8.88662E-01
8.28802E-01	9.69800E-01	1.00135E 00	4.51923E-01	9.08363E-01	1.01016E 00	1.23613E 00	9.89941E-01	8.99226E-01
8.94842E-01	9.75400E-01	1.00141E 00	4.61306E-01	9.26487E-01	1.00856E 00	1.24599E 00	9.91514E-01	9.18625E-01
9.58342E-01	9.77900E-01	1.00140E 00	4.65417E-01	9.34400E-01	1.00782E 00	1.24487E 00	9.92245E-01	9.27154E-01
1.02438E 00	9.82400E-01	1.00133E 00	4.72716E-01	9.48399E-01	1.00642E 00	1.23280E 00	9.93617E-01	9.42345E-01
1.08534E 00	9.85400E-01	1.00124E 00	4.77508E-01	9.57550E-01	1.00545E 00	1.21611E 00	9.94577E-01	9.52358E-01
1.14884E 00	9.86400E-01	1.00119E 00	4.79093E-01	9.60570E-01	1.00512E 00	1.20880E 00	9.94908E-01	9.55678E-01
1.21234E 00	9.87900E-01	1.00112E 00	4.81456E-01	9.65063E-01	1.00461E 00	1.19609E 00	9.95412E-01	9.60635E-01
1.27584E 00	9.91000E-01	1.00093E 00	4.86300E-01	9.74243E-01	1.00352E 00	1.16272E 00	9.96493E-01	9.70826E-01
1.33680E 00	9.93000E-01	1.00077E 00	4.89393E-01	9.80081E-01	1.00279E 00	1.13555E 00	9.97222E-01	9.77359E-01
1.40284E 00	9.94500E-01	1.00064E 00	4.91692E-01	9.84408E-01	1.00222E 00	1.11203E 00	9.97786E-01	9.82228E-01
1.46634E 00	9.96000E-01	1.00049E 00	4.93985E-01	9.88711E-01	1.00164E 00	1.08565E 00	9.98366E-01	9.87096E-01
1.52984E 00	9.99000E-01	1.00013E 00	4.98526E-01	9.97193E-01	1.00042E 00	1.02352E 00	9.99579E-01	9.96772E-01
1.59334E 00	9.99500E-01	1.00007E 00	4.99281E-01	9.98597E-01	1.00021E 00	1.01192E 00	9.99788E-01	9.98386E-01
1.65684E 00	1.00000E 00	1.00000E 00	5.00030E-01	9.99990E-01	1.00000E 00	1.00000E 00	9.99999E-01	9.99990E-01
1.72034E 00	1.00000E 00	1.00000E 00	5.00035E-01	1.00000E 00	1.00000E 00	1.00000E 00	1.00000E 00	1.00000E 00

THE DATA

Y*US/DS	VEL DEF	Y+	U+	Y/D	C. WAKE	REY	U/U1
0.0	2.8860E 01	0.0	0.0	0.0	0.0	0.0	0.0
9.1678E-04	1.5722E 01	1.6413E 02	1.3138E 01	3.8601E-03	3.5013E 00	4.6897E 03	4.5524E-01
2.9098E-03	1.3642E 01	5.2093E 02	1.5219E 01	1.2252E-02	4.0971E 00	1.4885E 04	5.2732E-01
4.9028E-03	1.2358E 01	8.7773E 02	1.6463E 01	2.0643E-02	4.1294E 00	2.5080E 04	5.7042E-01
7.2944E-03	1.1582E 01	1.3059E 03	1.7278E 01	3.0713E-02	4.2541E 00	3.7314E 04	5.9870E-01
8.8887E-03	1.1112E 01	1.5913E 03	1.7748E 01	3.7426E-02	4.2670E 00	4.5470E 04	6.1496E-01
1.1280E-02	1.0582E 01	2.0195E 03	1.8278E 01	4.7496E-02	4.3097E 00	5.7703E 04	6.3332E-01
1.2875E-02	1.0142E 01	2.3049E 03	1.8718E 01	5.4209E-02	4.2203E 00	6.5859E 04	6.4859E-01
1.6861E-02	9.5031E 00	3.0185E 03	1.9357E 01	7.0993E-02	4.2381E 00	8.6249E 04	6.7072E-01
2.0847E-02	8.9419E 00	3.7321E 03	1.9918E 01	8.7776E-02	4.2066E 00	1.0664E 05	6.9016E-01
2.4833E-02	8.6088E 00	4.4457E 03	2.0251E 01	1.0456E-01	4.2802E 00	1.2703E 05	7.0171E-01
2.8819E-02	8.0253E 00	5.1593E 03	2.0835E 01	1.2134E-01	4.1114E 00	1.4742E 05	7.2192E-01
3.2805E-02	7.6466E 00	5.8729E 03	2.1214E 01	1.3813E-01	4.0639E 00	1.6781E 05	7.3505E-01
3.7189E-02	7.8982E 00	6.6579E 03	2.0962E 01	1.5659E-01	4.4940E 00	1.9024E 05	7.2633E-01
4.0777E-02	7.0339E 00	7.3001E 03	2.1826E 01	1.7169E-01	4.0017E 00	2.0859E 05	7.5628E-01
4.4763E-02	6.6055E 00	8.0137E 03	2.2255E 01	1.8847E-01	3.8473E 00	2.2898E 05	7.7112E-01
4.8749E-02	6.3136E 00	8.7273E 03	2.2547E 01	2.0526E-01	3.7829E 00	2.4937E 05	7.8124E-01
5.2735E-02	6.1986E 00	9.4409E 03	2.2662E 01	2.2204E-01	3.8422E 00	2.6976E 05	7.8522E-01
5.6721E-02	5.8006E 00	1.0155E 04	2.3060E 01	2.3882E-01	3.6726E 00	2.9015E 05	7.9901E-01
6.0707E-02	5.5768E 00	1.0868E 04	2.3283E 01	2.5561E-01	3.6279E 00	3.1054E 05	8.0677E-01
7.1070E-02	5.0834E 00	1.2723E 04	2.3777E 01	2.9924E-01	3.5440E 00	3.6355E 05	8.2386E-01
8.0636E-02	4.8152E 00	1.4436E 04	2.4045E 01	3.3952E-01	3.5746E 00	4.1249E 05	8.3316E-01
9.0601E-02	4.7087E 00	1.6220E 04	2.4151E 01	3.8148E-01	3.7114E 00	4.6346E 05	8.3684E-01
1.0057E-01	3.7685E 00	1.8004E 04	2.5092E 01	4.2344E-01	3.1828E 00	5.1444E 05	8.6942E-01
1.1053E-01	3.2225E 00	1.9788E 04	2.5638E 01	4.6540E-01	2.9394E 00	5.6541E 05	8.8834E-01
1.2050E-01	2.9313E 00	2.1572E 04	2.5929E 01	5.0735E-01	2.8769E 00	6.1639E 05	8.9843E-01
1.3006E-01	2.6447E 00	2.3285E 04	2.6216E 01	5.4763E-01	2.7993E 00	6.6532E 05	9.0836E-01
1.4043E-01	2.1216E 00	2.5140E 04	2.6739E 01	5.9127E-01	2.5400E 00	7.1834E 05	9.2649E-01
1.5039E-01	1.8932E 00	2.6924E 04	2.6967E 01	6.3323E-01	2.4925E 00	7.6931E 05	9.3440E-01
1.6075E-01	1.4892E 00	2.8779E 04	2.7371E 01	6.7686E-01	2.3060E 00	8.2233E 05	9.4840E-01
1.7032E-01	1.2251E 00	3.0492E 04	2.7635E 01	7.1714E-01	2.2108E 00	8.7126E 05	9.5755E-01
1.8029E-01	1.1380E 00	3.2276E 04	2.7722E 01	7.5910E-01	2.2500E 00	9.2224E 05	9.6057E-01
1.9025E-01	1.0083E 00	3.4060E 04	2.7852E 01	8.0106E-01	2.2508E 00	9.7321E 05	9.6506E-01
2.0022E-01	7.4337E-01	3.5844E 04	2.8117E 01	8.4302E-01	2.1422E 00	1.0242E 06	9.7424E-01
2.0978E-01	5.7485E-01	3.7557E 04	2.8285E 01	8.8330E-01	2.0997E 00	1.0731E 06	9.8008E-01
2.2015E-01	4.5000E-01	3.9412E 04	2.8410E 01	9.2693E-01	2.0937E 00	1.1261E 06	9.8441E-01
2.3011E-01	3.2580E-01	4.1196E 04	2.8534E 01	9.6889E-01	2.0808E 00	1.1771E 06	9.8871E-01
2.4008E-01	8.1018E-02	4.2980E 04	2.8779E 01	1.0108E 00	1.9714E 00	1.2281E 06	9.9719E-01
2.5004E-01	4.0483E-02	4.4764E 04	2.8820E 01	1.0528E 00	2.0162E 00	1.2791E 06	9.9860E-01
2.6001E-01	2.7523E-04	4.6548E 04	2.8860E 01	1.0948E 00	2.0582E 00	1.3300E 06	9.9999E-01
2.6997E-01	1.7202E-06	4.8332E 04	2.8860E 01	1.1367E 00	2.1282E 00	1.3810E 06	1.0000E 00

PI FOR COLES WAKE FUNCTION = -1.2259E 00

RUN NUMBER 76- 34

THIS DATA REDUCTION SHOT IS FOR AN ADIABATIC WALL

RECOVERY FACTOR = 0.8800

PRANDTL NUMBER = 0.8090

GAMMA = 1.4000

FREE-STREAM UNIT REYNOLDS NO. PER METER= 9.5141E 06

DELTA(CM) = 1.4942E 00

DELTA STAR(CM) = 2.1166E-01 DELTA STAR(CM) NEW = 2.1155E-01

THETA(CM) = 1.4779E-01 THETA(CM) NEW = 1.4806E-01

SHAPE FACTOR = 1.4321E 00 NEW SHAPE FACTOR = 1.4288E 00

SKIN FRICTION = 2.2500E-03

Y	PT2	TO/TOE	M	U/UE	T/TE	TBAR	RHO/RHOE	RHO*U/(RHOE*UE)
0.0	8.43002E-01	9.94284E-01	0.0	0.0	1.04400E 00	0.0	9.57850E-01	0.0
5.84200E-03	8.72900E-01	9.96176E-01	2.23684E-01	4.55236E-01	1.03563E 00	3.31003E-01	9.65597E-01	4.39575E-01
1.85420E-02	8.83400E-01	9.96826E-01	2.59461E-01	5.27319E-01	1.03277E 00	4.44621E-01	9.68271E-01	5.10587E-01
3.12420E-02	8.89900E-01	9.97223E-01	2.79184E-01	5.66923E-01	1.03102E 00	5.14222E-01	9.69915E-01	5.49867E-01
4.39420E-02	8.95000E-01	9.97534E-01	2.93668E-01	5.95940E-01	1.02966E 00	5.68568E-01	9.71197E-01	5.78775E-01
5.66420E-02	8.98500E-01	9.97746E-01	3.03175E-01	6.14956E-01	1.02873E 00	6.05594E-01	9.72074E-01	5.97782E-01
8.20420E-02	9.05000E-01	9.98137E-01	3.20024E-01	6.48590E-01	1.02701E 00	6.74082E-01	9.73697E-01	6.31530E-01
1.07442E-01	9.10600E-01	9.98471E-01	3.33786E-01	6.75999E-01	1.02555E 00	7.32560E-01	9.75087E-01	6.59158E-01
1.32842E-01	9.15100E-01	9.98738E-01	3.44410E-01	6.97117E-01	1.02438E 00	7.79120E-01	9.76201E-01	6.80527E-01
1.58242E-01	9.18600E-01	9.98943E-01	3.52423E-01	7.13021E-01	1.02347E 00	8.15033E-01	9.77066E-01	6.96668E-01
1.83642E-01	9.22100E-01	9.99147E-01	3.60245E-01	7.28524E-01	1.02257E 00	8.50787E-01	9.77928E-01	7.12444E-01
2.09042E-01	9.25100E-01	9.99321E-01	3.66790E-01	7.41481E-01	1.02180E 00	8.81138E-01	9.78666E-01	7.25663E-01
2.34442E-01	9.28100E-01	9.99492E-01	3.73214E-01	7.54184E-01	1.02103E 00	9.11171E-01	9.79404E-01	7.38651E-01
2.59842E-01	9.30200E-01	9.99611E-01	3.77634E-01	7.62915E-01	1.02049E 00	9.31988E-01	9.79919E-01	7.47595E-01
2.85242E-01	9.32700E-01	9.99752E-01	3.82826E-01	7.73162E-01	1.01985E 00	9.56618E-01	9.80534E-01	7.58111E-01
3.10642E-01	9.35200E-01	9.99891E-01	3.87930E-01	7.83225E-01	1.01922E 00	9.80931E-01	9.81147E-01	7.68459E-01
3.36042E-01	9.37700E-01	1.00003E 00	3.92968E-01	7.93147E-01	1.01858E 00	1.00477E 00	9.81762E-01	7.78682E-01
3.61442E-01	9.39700E-01	1.00013E 00	3.96940E-01	8.00964E-01	1.01807E 00	1.02368E 00	9.82253E-01	7.86749E-01
3.86842E-01	9.41200E-01	1.00021E 00	3.99890E-01	8.06765E-01	1.01768E 00	1.03734E 00	9.82624E-01	7.92747E-01
4.52882E-01	9.46700E-01	1.00050E 00	4.10499E-01	8.27596E-01	1.01628E 00	1.08692E 00	9.83983E-01	8.14341E-01
5.13842E-01	9.51800E-01	1.00074E 00	4.20058E-01	8.46321E-01	1.01497E 00	1.12951E 00	9.85255E-01	8.33842E-01
5.77342E-01	9.56300E-01	1.00093E 00	4.28287E-01	8.62403E-01	1.01380E 00	1.16367E 00	9.86391E-01	8.50667E-01
6.40842E-01	9.59800E-01	1.00107E 00	4.34560E-01	8.74637E-01	1.01288E 00	1.18735E 00	9.87287E-01	8.63517E-01
7.04342E-01	9.64800E-01	1.00123E 00	4.43342E-01	8.91724E-01	1.01154E 00	1.21595E 00	9.88593E-01	8.81552E-01
7.67842E-01	9.68800E-01	1.00133E 00	4.50221E-01	9.05068E-01	1.01044E 00	1.23296E 00	9.89666E-01	8.95715E-01
8.31342E-01	9.71400E-01	1.00137E 00	4.54627E-01	9.13595E-01	1.00971E 00	1.24058E 00	9.90381E-01	9.04807E-01
8.97382E-01	9.75900E-01	1.00141E 00	4.62132E-01	9.28079E-01	1.00841E 00	1.24615E 00	9.91659E-01	9.20338E-01
9.60982E-01	9.80400E-01	1.00137E 00	4.69492E-01	9.42224E-01	1.00705E 00	1.23995E 00	9.92998E-01	9.35627E-01
1.02184E 00	9.83400E-01	1.00130E 00	4.74322E-01	9.51470E-01	1.00610E 00	1.22787E 00	9.93933E-01	9.45697E-01
1.08534E 00	9.84400E-01	1.00127E 00	4.75918E-01	9.54517E-01	1.00578E 00	1.22247E 00	9.94253E-01	9.49031E-01
1.14884E 00	9.88400E-01	1.00109E 00	4.82243E-01	9.66557E-01	1.00444E 00	1.19132E 00	9.95583E-01	9.62288E-01
1.21234E 00	9.89400E-01	1.00103E 00	4.83808E-01	9.69525E-01	1.00409E 00	1.18115E 00	9.95928E-01	9.65577E-01
1.27584E 00	9.92000E-01	1.00086E 00	4.87847E-01	9.77165E-01	1.00316E 00	1.14969E 00	9.96854E-01	9.74091E-01
1.34442E 00	9.96000E-01	1.00049E 00	4.93985E-01	9.88711E-01	1.00164E 00	1.08565E 00	9.98366E-01	9.87096E-01
1.40792E 00	9.97000E-01	1.00038E 00	4.95503E-01	9.91552E-01	1.00124E 00	1.06642E 00	9.98762E-01	9.90324E-01
1.46634E 00	9.98000E-01	1.00026E 00	4.97017E-01	9.94380E-01	1.00083E 00	1.04576E 00	9.99166E-01	9.93551E-01
1.52984E 00	9.98500E-01	1.00020E 00	4.97774E-01	9.95792E-01	1.00063E 00	1.03480E 00	9.99372E-01	9.95167E-01
1.59334E 00	9.99500E-01	1.00007E 00	4.99281E-01	9.98598E-01	1.00021E 00	1.01208E 00	9.99788E-01	9.98386E-01
1.65684E 00	1.00000E 00	1.00000E 00	5.00030E-01	9.99990E-01	1.00000E 00	1.00000E 00	9.99999E-01	9.99990E-01
1.72034E 00	1.00000E 00	1.00000E 00	5.00035E-01	1.00000E 00	1.00000E 00	1.00000E 00	1.00000E 00	1.00000E 00

THE DATA

Y*US/DS	VEL DEF	Y+	U+	Y/D	C. WAKE	REY	U/U1
0.0	2.9179E 01	0.0	0.0	0.0	0.0	0.0	0.0
9.4640E-04	1.5896E 01	1.6033E 02	1.3283E 01	3.9097E-03	3.9527E 00	4.6318E 03	4.5524E-01
3.0038E-03	1.3792E 01	5.0887E 02	1.5387E 01	1.2409E-02	4.6363E 00	1.4701E 04	5.2732E-01
5.0612E-03	1.2637E 01	8.5742E 02	1.6542E 01	2.0909E-02	4.7553E 00	2.4770E 04	5.6692E-01
7.1186E-03	1.1790E 01	1.2060E 03	1.7389E 01	2.9408E-02	4.7492E 00	3.4839E 04	5.9594E-01
9.1760E-03	1.1235E 01	1.5545E 03	1.7944E 01	3.7907E-02	4.8126E 00	4.4908E 04	6.1496E-01
1.3291E-02	1.0254E 01	2.2516E 03	1.8925E 01	5.4906E-02	4.7480E 00	6.5046E 04	6.4859E-01
1.7406E-02	9.4541E 00	2.9487E 03	1.9725E 01	7.1905E-02	4.6228E 00	8.5185E 04	6.7600E-01
2.1520E-02	8.8379E 00	3.6458E 03	2.0341E 01	8.8904E-02	4.5356E 00	1.0532E 05	6.9712E-01
2.5635E-02	8.3738E 00	4.3429E 03	2.0805E 01	1.0590E-01	4.5036E 00	1.2546E 05	7.1302E-01
2.9750E-02	7.9214E 00	5.0399E 03	2.1258E 01	1.2290E-01	4.4238E 00	1.4560E 05	7.2852E-01
3.3865E-02	7.5434E 00	5.7370E 03	2.1636E 01	1.3990E-01	4.3683E 00	1.6574E 05	7.4148E-01
3.7980E-02	7.1727E 00	6.4341E 03	2.2006E 01	1.5690E-01	4.2864E 00	1.8588E 05	7.5418E-01
4.2094E-02	6.9179E 00	7.1312E 03	2.2261E 01	1.7390E-01	4.2835E 00	2.0601E 05	7.6292E-01
4.6209E-02	6.6189E 00	7.8283E 03	2.2560E 01	1.9090E-01	4.2190E 00	2.2615E 05	7.7316E-01
5.0324E-02	6.3253E 00	8.5254E 03	2.2854E 01	2.0790E-01	4.1415E 00	2.4629E 05	7.8323E-01
5.4439E-02	6.0358E 00	9.2225E 03	2.3143E 01	2.2489E-01	4.0528E 00	2.6643E 05	7.9315E-01
5.8554E-02	5.8077E 00	9.9195E 03	2.3371E 01	2.4189E-01	4.0072E 00	2.8657E 05	8.0096E-01
6.2668E-02	5.6384E 00	1.0617E 04	2.3541E 01	2.5889E-01	4.0041E 00	3.0670E 05	8.0677E-01
7.3367E-02	5.0306E 00	1.2429E 04	2.4149E 01	3.0309E-01	3.8011E 00	3.5906E 05	8.2760E-01
8.3242E-02	4.4842E 00	1.4102E 04	2.4695E 01	3.4389E-01	3.5842E 00	4.0740E 05	8.4632E-01
9.3529E-02	4.0150E 00	1.5845E 04	2.5164E 01	3.8638E-01	3.4157E 00	4.5774E 05	8.6240E-01
1.0382E-01	3.6580E 00	1.7588E 04	2.5521E 01	4.2888E-01	3.3223E 00	5.0809E 05	8.7464E-01
1.1410E-01	3.1594E 00	1.9330E 04	2.6020E 01	4.7138E-01	3.0780E 00	5.5843E 05	8.9172E-01
1.2439E-01	2.7700E 00	2.1073E 04	2.6409E 01	5.1387E-01	2.9150E 00	6.0878E 05	9.0507E-01
1.3468E-01	2.5212E 00	2.2816E 04	2.6658E 01	5.5637E-01	2.8646E 00	6.5912E 05	9.1359E-01
1.4538E-01	2.0986E 00	2.4628E 04	2.7081E 01	6.0057E-01	2.6492E 00	7.1148E 05	9.2808E-01
1.5566E-01	1.6858E 00	2.6371E 04	2.7493E 01	6.4307E-01	2.4250E 00	7.6183E 05	9.4222E-01
1.6554E-01	1.4161E 00	2.8044E 04	2.7763E 01	6.8396E-01	2.3156E 00	8.1016E 05	9.5147E-01
1.7583E-01	1.3272E 00	2.9787E 04	2.7852E 01	7.2636E-01	2.3681E 00	8.6051E 05	9.5452E-01
1.8611E-01	9.7583E-01	3.1529E 04	2.8203E 01	7.6886E-01	2.1742E 00	9.1085E 05	9.6656E-01
1.9640E-01	8.8925E-01	3.3272E 04	2.8290E 01	8.1135E-01	2.2144E 00	9.6120E 05	9.6952E-01
2.0669E-01	6.6632E-01	3.5015E 04	2.8513E 01	8.5385E-01	2.1244E 00	1.0115E 06	9.7716E-01
2.1780E-01	3.2940E-01	3.6897E 04	2.8850E 01	8.9975E-01	1.9335E 00	1.0659E 06	9.8871E-01
2.2808E-01	2.4650E-01	3.8640E 04	2.8933E 01	9.4225E-01	1.9601E 00	1.1163E 06	9.9155E-01
2.3755E-01	1.6399E-01	4.0243E 04	2.9015E 01	9.8134E-01	1.9748E 00	1.1626E 06	9.9438E-01
2.4783E-01	1.2278E-01	4.1986E 04	2.9056E 01	1.0238E 00	2.0310E 00	1.2129E 06	9.9579E-01
2.5812E-01	4.0917E-02	4.3728E 04	2.9138E 01	1.0663E 00	2.0464E 00	1.2633E 06	9.9860E-01
2.6841E-01	2.7827E-04	4.5471E 04	2.9179E 01	1.1088E 00	2.0957E 00	1.3136E 06	9.9999E-01
2.7870E-01	1.7392E-06	4.7214E 04	2.9179E 01	1.1513E 00	2.1785E 00	1.3640E 06	1.0000E 00

PI FOR COLES WAKE FUNCTION = -1.0258E 00

RUN NUMBER 76- 32

THIS DATA REDUCTION SHOT IS FOR AN ADIABATIC WALL

RECOVERY FACTOR = 0.8800

PRANDTL NUMBER = 0.8090

GAMMA = 1.4000

FREE-STREAM UNIT REYNOLDS NO. PER METER= 1.0090E 07

DELTA(CM) = 1.2640E 00

DELTA STAR(CM) = 1.4557E-01 DELTA STAR(CM) NEW = 1.4529E-01

THETA(CM) = 1.0420E-01 THETA(CM) NEW = 1.0456E-01

SHAPE FACTOR = 1.3970E 00 NEW SHAPE FACTOR = 1.3896E 00

SKIN FRICTION = 2.6215E-03

Y	PT2	TO/TOE	M	U/UE	T/TE	TBAR	RHO/RHOE	RHO*U/(RHOE*UE)
0.0	8.43002E-01	9.94284E-01	0.0	0.0	1.04400E 00	0.0	9.57850E-01	0.0
5.84200E-03	8.76200E-01	9.96381E-01	2.35552E-01	4.79181E-01	1.03472E 00	3.66916E-01	9.66441E-01	4.63100E-01
2.10820E-02	8.93700E-01	9.97455E-01	2.90049E-01	5.88695E-01	1.03000E 00	5.54743E-01	9.70870E-01	5.71547E-01
3.12420E-02	8.98200E-01	9.97728E-01	3.02372E-01	6.13350E-01	1.02881E 00	6.02415E-01	9.71999E-01	5.96176E-01
4.14020E-02	9.04700E-01	9.98119E-01	3.19263E-01	6.47073E-01	1.02709E 00	6.70904E-01	9.73622E-01	6.30004E-01
5.66420E-02	9.09200E-01	9.98388E-01	3.30405E-01	6.69270E-01	1.02591E 00	7.17941E-01	9.74740E-01	6.52365E-01
8.20420E-02	9.17700E-01	9.98890E-01	3.50387E-01	7.08983E-01	1.02370E 00	8.05816E-01	9.76844E-01	6.92566E-01
1.07442E-01	9.22200E-01	9.99153E-01	3.60463E-01	7.28957E-01	1.02254E 00	8.51740E-01	9.77953E-01	7.12885E-01
1.32842E-01	9.28600E-01	9.99520E-01	3.74273E-01	7.56277E-01	1.02090E 00	9.15938E-01	9.79527E-01	7.40794E-01
1.58242E-01	9.44100E-01	1.00036E 00	4.05526E-01	8.17839E-01	1.01694E 00	1.06388E 00	9.83340E-01	8.04214E-01
1.83642E-01	9.37600E-01	1.00002E 00	3.92768E-01	7.92753E-01	1.01860E 00	1.00381E 00	9.81737E-01	7.78275E-01
2.09042E-01	9.40100E-01	1.00016E 00	3.97726E-01	8.02510E-01	1.01797E 00	1.02733E 00	9.82352E-01	7.88347E-01
2.34442E-01	9.45600E-01	1.00044E 00	4.08403E-01	8.23484E-01	1.01656E 00	1.07723E 00	9.83711E-01	8.10070E-01
2.59842E-01	9.42100E-01	1.00026E 00	4.01645E-01	8.10214E-01	1.01745E 00	1.04576E 00	9.82845E-01	7.96315E-01
2.87782E-01	9.46600E-01	1.00049E 00	4.10308E-01	8.27220E-01	1.01630E 00	1.08597E 00	9.83958E-01	8.13950E-01
3.10642E-01	9.54600E-01	1.00086E 00	4.25198E-01	8.56370E-01	1.01424E 00	1.15112E 00	9.85960E-01	8.44346E-01
3.36042E-01	9.56600E-01	1.00095E 00	4.28827E-01	8.63457E-01	1.01372E 00	1.16558E 00	9.86468E-01	8.51772E-01
3.61442E-01	9.54600E-01	1.00086E 00	4.25198E-01	8.56369E-01	1.01424E 00	1.15112E 00	9.85960E-01	8.44345E-01
3.86842E-01	9.57100E-01	1.00097E 00	4.29732E-01	8.65224E-01	1.01359E 00	1.16939E 00	9.86595E-01	8.53625E-01
4.50342E-01	9.59100E-01	1.00105E 00	4.33312E-01	8.72206E-01	1.01306E 00	1.18290E 00	9.87107E-01	8.60960E-01
5.13842E-01	9.66600E-01	1.00128E 00	4.46451E-01	8.97758E-01	1.01105E 00	1.22422E 00	9.89072E-01	8.87948E-01
5.77342E-01	9.76500E-01	1.00141E 00	4.63122E-01	9.29985E-01	1.00823E 00	1.24599E 00	9.91834E-01	9.22391E-01
6.40842E-01	9.82500E-01	1.00133E 00	4.72877E-01	9.48708E-01	1.00639E 00	1.23232E 00	9.93648E-01	9.42681E-01
7.04342E-01	9.83500E-01	1.00130E 00	4.74483E-01	9.51776E-01	1.00607E 00	1.22755E 00	9.93965E-01	9.46032E-01
9.07542E-01	9.88000E-01	1.00112E 00	4.81615E-01	9.65365E-01	1.00458E 00	1.19530E 00	9.95445E-01	9.60967E-01
9.58342E-01	9.87500E-01	1.00114E 00	4.80827E-01	9.63867E-01	1.00475E 00	1.19975E 00	9.95276E-01	9.59314E-01
1.02184E 00	9.91000E-01	1.00093E 00	4.86300E-01	9.74243E-01	1.00352E 00	1.16272E 00	9.96493E-01	9.70827E-01
1.08534E 00	9.92000E-01	1.00086E 00	4.87847E-01	9.77164E-01	1.00316E 00	1.14969E 00	9.96854E-01	9.74090E-01
1.14884E 00	9.95000E-01	1.00059E 00	4.92458E-01	9.85846E-01	1.00203E 00	1.10361E 00	9.97977E-01	9.83852E-01
1.21234E 00	9.97000E-01	1.00038E 00	4.95503E-01	9.91552E-01	1.00124E 00	1.06642E 00	9.98762E-01	9.90324E-01
1.27584E 00	9.98500E-01	1.00020E 00	4.97774E-01	9.95793E-01	1.00063E 00	1.03480E 00	9.99372E-01	9.95167E-01
1.33934E 00	9.99500E-01	1.00007E 00	4.99281E-01	9.98598E-01	1.00021E 00	1.01208E 00	9.99788E-01	9.98386E-01
1.40284E 00	9.99000E-01	1.00013E 00	4.98526E-01	9.97192E-01	1.00042E 00	1.02368E 00	9.99578E-01	9.96771E-01
1.46634E 00	9.99000E-01	1.00013E 00	4.98526E-01	9.97192E-01	1.00042E 00	1.02368E 00	9.99578E-01	9.96771E-01
1.59334E 00	1.00000E 00	9.99999E-01	5.00030E-01	9.99991E-01	1.00000E 00	9.99841E-01	1.00000E 00	9.99991E-01
1.52984E 00	1.00000E 00	1.00000E 00	5.00035E-01	1.00000E 00	1.00000E 00	1.00000E 00	1.00000E 00	1.00000E 00

THE DATA

Y*US/DS	VEL DEF	Y+	U+	Y/D	C. WAKE	REY	U/U1
0.0	2.7033E 01	0.0	0.0	0.0	0.0	0.0	0.0
1.4874E-03	1.4079E 01	1.8353E 02	1.2954E 01	4.6219E-03	2.3759E 00	4.9119E 03	4.7918E-01
5.3677E-03	1.1119E 01	6.6230E 02	1.5914E 01	1.6679E-02	2.4728E 00	1.7726E 04	5.8870E-01
7.9545E-03	1.0452E 01	9.8148E 02	1.6580E 01	2.4717E-02	2.6157E 00	2.6268E 04	6.1335E-01
1.0541E-02	9.5406E 00	1.3007E 03	1.7492E 01	3.2755E-02	2.5111E 00	3.4811E 04	6.4707E-01
1.4422E-02	8.9405E 00	1.7794E 03	1.8092E 01	4.4813E-02	2.5913E 00	4.7625E 04	6.6927E-01
2.0889E-02	7.8670E 00	2.5774E 03	1.9166E 01	6.4908E-02	2.5124E 00	6.8981E 04	7.0898E-01
2.7356E-02	7.3270E 00	3.3753E 03	1.9706E 01	8.5003E-02	2.5694E 00	9.0337E 04	7.2896E-01
3.3823E-02	6.5885E 00	4.1733E 03	2.0444E 01	1.0510E-01	2.4649E 00	1.1169E 05	7.5628E-01
4.0290E-02	4.9243E 00	4.9712E 03	2.2108E 01	1.2519E-01	1.8769E 00	1.3305E 05	8.1784E-01
4.6757E-02	5.6024E 00	5.7692E 03	2.1430E 01	1.4529E-01	2.3720E 00	1.5441E 05	7.9275E-01
5.3224E-02	5.3387E 00	6.5671E 03	2.1694E 01	1.6538E-01	2.3968E 00	1.7576E 05	8.0251E-01
5.9691E-02	4.7717E 00	7.3651E 03	2.2261E 01	1.8548E-01	2.2601E 00	1.9712E 05	8.2348E-01
6.6158E-02	5.1304E 00	8.1630E 03	2.1902E 01	2.0558E-01	2.5498E 00	2.1847E 05	8.1021E-01
7.3272E-02	4.6707E 00	9.0408E 03	2.2362E 01	2.2768E-01	2.4495E 00	2.4197E 05	8.2722E-01
7.9093E-02	3.8827E 00	9.7589E 03	2.3150E 01	2.4577E-01	2.1633E 00	2.6119E 05	8.5637E-01
8.5560E-02	3.6911E 00	1.0557E 04	2.3342E 01	2.6586E-01	2.1632E 00	2.8254E 05	8.6346E-01
9.2027E-02	3.8827E 00	1.1355E 04	2.3150E 01	2.8596E-01	2.3385E 00	3.0390E 05	8.5637E-01
9.8494E-02	3.6434E 00	1.2153E 04	2.3389E 01	3.0605E-01	2.3032E 00	3.2526E 05	8.6522E-01
1.1466E-01	3.4546E 00	1.4148E 04	2.3578E 01	3.5629E-01	2.3891E 00	3.7865E 05	8.7221E-01
1.3083E-01	2.7639E 00	1.6143E 04	2.4269E 01	4.0653E-01	2.2130E 00	4.3204E 05	8.9776E-01
1.4700E-01	1.8927E 00	1.8137E 04	2.5140E 01	4.5677E-01	1.9334E 00	4.8543E 05	9.2998E-01
1.6316E-01	1.3866E 00	2.0132E 04	2.5646E 01	5.0701E-01	1.8131E 00	5.3882E 05	9.4871E-01
1.7933E-01	1.3036E 00	2.2127E 04	2.5729E 01	5.5724E-01	1.8826E 00	5.9221E 05	9.5178E-01
2.3107E-01	9.3629E-01	2.8511E 04	2.6096E 01	7.1801E-01	1.9999E 00	7.6306E 05	9.6536E-01
2.4400E-01	9.7677E-01	3.0107E 04	2.6056E 01	7.5820E-01	2.0818E 00	8.0577E 05	9.6387E-01
2.6017E-01	6.9628E-01	3.2102E 04	2.6336E 01	8.0844E-01	2.0223E 00	8.5916E 05	9.7424E-01
2.7634E-01	6.1732E-01	3.4096E 04	2.6415E 01	8.5868E-01	2.0541E 00	9.1255E 05	9.7716E-01
2.9251E-01	3.8262E-01	3.6091E 04	2.6650E 01	9.0891E-01	2.0079E 00	9.6595E 05	9.8585E-01
3.0867E-01	2.2838E-01	3.8086E 04	2.6804E 01	9.5915E-01	1.9964E 00	1.0193E 06	9.9155E-01
3.2484E-01	1.1374E-01	4.0081E 04	2.6919E 01	1.0094E 00	2.0005E 00	1.0727E 06	9.9579E-01
3.4101E-01	3.7907E-02	4.2076E 04	2.6995E 01	1.0596E 00	2.0203E 00	1.1261E 06	9.9860E-01
3.5718E-01	7.5901E-02	4.4071E 04	2.6957E 01	1.1099E 00	2.0916E 00	1.1795E 06	9.9719E-01
3.7335E-01	7.5901E-02	4.6066E 04	2.6957E 01	1.1601E 00	2.1424E 00	1.2329E 06	9.9719E-01
4.0568E-01	2.4652E-04	5.0055E 04	2.7032E 01	1.2606E 00	2.2018E 00	1.3397E 06	9.9999E-01
3.8951E-01	0.0	4.8061E 04	2.7033E 01	1.2103E 00	2.1550E 00	1.2863E 06	1.0000E 00

PI FOR COLES WAKE FUNCTION = -2.0362E 00

RUN NUMBER 76- 36

THIS DATA REDUCTION SHOT IS FOR AN ADIABATIC WALL

RECOVERY FACTOR = 0.8800

PRANDTL NUMBER = 0.8090

GAMMA = 1.4000

FREE-STREAM UNIT REYNOLDS NO. PER METER= 9.6508E 06

DELTA(CM) = 2.2281E 00

DELTA STAR(CM) = 3.1676E-01 DELTA STAR(CM) NEW = 3.1660E-01

THETA(CM) = 2.1805E-01 THETA(CM) NEW = 2.1829E-01

SHAPE FACTOR = 1.4527E 00 NEW SHAPE FACTOR = 1.4504E 00

SKIN FRICTION = 1.9500E-03

Y	PT2	TO/TOE	M	U/UE	T/TE	TBAR	RHO/RHOE	RHO*U/(RHOE*UE)
0.0	8.43002E-01	9.94284E-01	0.0	0.0	1.04400E 00	0.0	9.57850E-01	0.0
5.84200E-03	8.64600E-01	9.95658E-01	1.90442E-01	3.88012E-01	1.03792E 00	2.40267E-01	9.63467E-01	3.73837E-01
1.85420E-02	8.73600E-01	9.96220E-01	2.26259E-01	4.60435E-01	1.03544E 00	3.38630E-01	9.65777E-01	4.44677E-01
3.12420E-02	8.79500E-01	9.96585E-01	2.46812E-01	5.01868E-01	1.03382E 00	4.02511E-01	9.67282E-01	4.85448E-01
4.39420E-02	8.85000E-01	9.96924E-01	2.64457E-01	5.37361E-01	1.03234E 00	4.61783E-01	9.68677E-01	5.20529E-01
5.91820E-02	8.87500E-01	9.97077E-01	2.72074E-01	5.52657E-01	1.03166E 00	4.88638E-01	9.69308E-01	5.35695E-01
6.93420E-02	8.92000E-01	9.97351E-01	2.85242E-01	5.79066E-01	1.03046E 00	5.36628E-01	9.70443E-01	5.61950E-01
8.45820E-02	8.94500E-01	9.97503E-01	2.92284E-01	5.93171E-01	1.02979E 00	5.63165E-01	9.71072E-01	5.76012E-01
1.07442E-01	8.99500E-01	9.97807E-01	3.05837E-01	6.20276E-01	1.02846E 00	6.16240E-01	9.72324E-01	6.03109E-01
1.32842E-01	9.03400E-01	9.98041E-01	3.15968E-01	6.40500E-01	1.02743E 00	6.57238E-01	9.73298E-01	6.23398E-01
1.60782E-01	9.04900E-01	9.98131E-01	3.19770E-01	6.48085E-01	1.02704E 00	6.72970E-01	9.73671E-01	6.31022E-01
1.83642E-01	9.08900E-01	9.98370E-01	3.29675E-01	6.67818E-01	1.02599E 00	7.14762E-01	9.74666E-01	6.50899E-01
2.11582E-01	9.10900E-01	9.98489E-01	3.34507E-01	6.77433E-01	1.02547E 00	7.35579E-01	9.75162E-01	6.60607E-01
2.34442E-01	9.12400E-01	9.98578E-01	3.38080E-01	6.84538E-01	1.02508E 00	7.51152E-01	9.75534E-01	6.67790E-01
2.59842E-01	9.17400E-01	9.98873E-01	3.49699E-01	7.07618E-01	1.02378E 00	8.02797E-01	9.76769E-01	6.91179E-01
2.85242E-01	9.19900E-01	9.99019E-01	3.55354E-01	7.18832E-01	1.02314E 00	8.28381E-01	9.77386E-01	7.02576E-01
3.10642E-01	9.22300E-01	9.99159E-01	3.60681E-01	7.29389E-01	1.02252E 00	8.52852E-01	9.77977E-01	7.13325E-01
3.36042E-01	9.24300E-01	9.99274E-01	3.65057E-01	7.38052E-01	1.02201E 00	8.73034E-01	9.78469E-01	7.22161E-01
3.61442E-01	9.26300E-01	9.99390E-01	3.69375E-01	7.46593E-01	1.02149E 00	8.93215E-01	9.78960E-01	7.30885E-01
3.86842E-01	9.27800E-01	9.99476E-01	3.72581E-01	7.52934E-01	1.02111E 00	9.08311E-01	9.79330E-01	7.37370E-01
4.47802E-01	9.31800E-01	9.99702E-01	3.80966E-01	7.69492E-01	1.02008E 00	9.47879E-01	9.80312E-01	7.54342E-01
5.13842E-01	9.36300E-01	9.99951E-01	3.90155E-01	7.87608E-01	1.01893E 00	9.91419E-01	9.81418E-01	7.72972E-01
5.77342E-01	9.42800E-01	1.00030E 00	4.03008E-01	8.12893E-01	1.01727E 00	1.05212E 00	9.83018E-01	7.99089E-01
6.40842E-01	9.46700E-01	1.00050E 00	4.10499E-01	8.27596E-01	1.01628E 00	1.08692E 00	9.83983E-01	8.14341E-01
7.04342E-01	9.49700E-01	1.00064E 00	4.16152E-01	8.38675E-01	1.01551E 00	1.11235E 00	9.84730E-01	8.25868E-01
7.67842E-01	9.52200E-01	1.00076E 00	4.20796E-01	8.47764E-01	1.01486E 00	1.13269E 00	9.85355E-01	8.35348E-01
8.26262E-01	9.57200E-01	1.00097E 00	4.29910E-01	8.65570E-01	1.01356E 00	1.17003E 00	9.86620E-01	8.53989E-01
9.12622E-01	9.59700E-01	1.00107E 00	4.34384E-01	8.74294E-01	1.01290E 00	1.18687E 00	9.87261E-01	8.63157E-01
8.49122E-01	9.65200E-01	1.00124E 00	4.44036E-01	8.93070E-01	1.01143E 00	1.21786E 00	9.88699E-01	8.82978E-01
1.02184E 00	9.66200E-01	1.00127E 00	4.45761E-01	8.96420E-01	1.01116E 00	1.22247E 00	9.88965E-01	8.86528E-01
1.09788E 00	9.69600E-01	1.00134E 00	4.51580E-01	9.07700E-01	1.01022E 00	1.23534E 00	9.89886E-01	8.98519E-01
1.15138E 00	9.72100E-01	1.00138E 00	4.55800E-01	9.15862E-01	1.00951E 00	1.24201E 00	9.90577E-01	9.07231E-01
1.21234E 00	9.74600E-01	1.00140E 00	4.59976E-01	9.23923E-01	1.00879E 00	1.24551E 00	9.91285E-01	9.15870E-01
1.27584E 00	9.76100E-01	1.00141E 00	4.62457E-01	9.28705E-01	1.00835E 00	1.24599E 00	9.91717E-01	9.21012E-01
1.33934E 00	9.76600E-01	1.00141E 00	4.63281E-01	9.30291E-01	1.00820E 00	1.24599E 00	9.91862E-01	9.22721E-01
1.40284E 00	9.80600E-01	1.00137E 00	4.69817E-01	9.42847E-01	1.00699E 00	1.23931E 00	9.93060E-01	9.36304E-01
1.46634E 00	9.81600E-01	1.00135E 00	4.71428E-01	9.45933E-01	1.00668E 00	1.23598E 00	9.93368E-01	9.39659E-01
1.52984E 00	9.82600E-01	1.00133E 00	4.73039E-01	9.49016E-01	1.00636E 00	1.23200E 00	9.93679E-01	9.43017E-01
1.59334E 00	9.85600E-01	1.00123E 00	4.77828E-01	9.58159E-01	1.00539E 00	1.21468E 00	9.94643E-01	9.53026E-01
1.65684E 00	9.86600E-01	1.00118E 00	4.79407E-01	9.61166E-01	1.00505E 00	1.20721E 00	9.94974E-01	9.56335E-01
1.72288E 00	9.88100E-01	1.00111E 00	4.81773E-01	9.65665E-01	1.00454E 00	1.19434E 00	9.95479E-01	9.61299E-01
1.78384E 00	9.89000E-01	1.00106E 00	4.83182E-01	9.68337E-01	1.00423E 00	1.18528E 00	9.95789E-01	9.64260E-01
2.31140E 00	1.00000E 00	1.00000E 00	5.00035E-01	1.00000E 00	1.00000E 00	1.00000E 00	1.00000E 00	1.00000E 00

THE DATA

Y*US/DS	VEL DEF	Y+	U+	Y/D	C. WAKE	REY	U/U1
0.0	3.1343E 01	0.0	0.0	0.0	0.0	0.0	0.0
5.8871E-04	1.9182E 01	1.5140E 02	1.2162E 01	2.6220E-03	1.1633E 01	4.6983E 03	3.8801E-01
1.8685E-03	1.6912E 01	4.8054E 02	1.4432E 01	8.3219E-03	1.2918E 01	1.4912E 04	4.6043E-01
3.1483E-03	1.5613E 01	8.0968E 02	1.5730E 01	1.4022E-02	1.2897E 01	2.5126E 04	5.0187E-01
4.4281E-03	1.4501E 01	1.1388E 03	1.6843E 01	1.9722E-02	1.2305E 01	3.5340E 04	5.3736E-01
5.9639E-03	1.4021E 01	1.5338E 03	1.7322E 01	2.6562E-02	1.2861E 01	4.7596E 04	5.5266E-01
6.9877E-03	1.3194E 01	1.7971E 03	1.8150E 01	3.1122E-02	1.1906E 01	5.5767E 04	5.7907E-01
8.5235E-03	1.2751E 01	2.1921E 03	1.8592E 01	3.7962E-02	1.2009E 01	6.8023E 04	5.9317E-01
1.0827E-02	1.1902E 01	2.7845E 03	1.9442E 01	4.8222E-02	1.1440E 01	8.6408E 04	6.2028E-01
1.3387E-02	1.1268E 01	3.4428E 03	2.0075E 01	5.9621E-02	1.1195E 01	1.0684E 05	6.4050E-01
1.6202E-02	1.1030E 01	4.1669E 03	2.0313E 01	7.2161E-02	1.1700E 01	1.2931E 05	6.4808E-01
1.8506E-02	1.0412E 01	4.7593E 03	2.0932E 01	8.2421E-02	1.1063E 01	1.4769E 05	6.6782E-01
2.1322E-02	1.0110E 01	5.4834E 03	2.1233E 01	9.4961E-02	1.1164E 01	1.7016E 05	6.7743E-01
2.3625E-02	9.8876E 00	6.0759E 03	2.1456E 01	1.0522E-01	1.1228E 01	1.8855E 05	6.8454E-01
2.6185E-02	9.1643E 00	6.7341E 03	2.2179E 01	1.1662E-01	1.0199E 01	2.0897E 05	7.0762E-01
2.8744E-02	8.8128E 00	7.3924E 03	2.2531E 01	1.2802E-01	9.9314E 00	2.2940E 05	7.1883E-01
3.1304E-02	8.4819E 00	8.0507E 03	2.2862E 01	1.3942E-01	9.6657E 00	2.4983E 05	7.2939E-01
3.3864E-02	8.2104E 00	8.7090E 03	2.3133E 01	1.5082E-01	9.4936E 00	2.7026E 05	7.3805E-01
3.6423E-02	7.9426E 00	9.3672E 03	2.3401E 01	1.6222E-01	9.2990E 00	2.9068E 05	7.4659E-01
3.8983E-02	7.7439E 00	1.0026E 04	2.3600E 01	1.7362E-01	9.2284E 00	3.1111E 05	7.5293E-01
4.5126E-02	7.2249E 00	1.1605E 04	2.4119E 01	2.0098E-01	8.8778E 00	3.6014E 05	7.6949E-01
5.1781E-02	6.6571E 00	1.3317E 04	2.4686E 01	2.3062E-01	8.3734E 00	4.1325E 05	7.8761E-01
5.8180E-02	5.8646E 00	1.4963E 04	2.5479E 01	2.5912E-01	7.2659E 00	4.6432E 05	8.1289E-01
6.4579E-02	5.4037E 00	1.6608E 04	2.5940E 01	2.8762E-01	6.8171E 00	5.1539E 05	8.2760E-01
7.0978E-02	5.0565E 00	1.8254E 04	2.6287E 01	3.1612E-01	6.5633E 00	5.6645E 05	8.3867E-01
7.7377E-02	4.7716E 00	1.9900E 04	2.6572E 01	3.4462E-01	6.4020E 00	6.1752E 05	8.4776E-01
8.3264E-02	4.2135E 00	2.1414E 04	2.7130E 01	3.7084E-01	5.5749E 00	6.6451E 05	8.6557E-01
9.1967E-02	3.9400E 00	2.3652E 04	2.7403E 01	4.0960E-01	5.5080E 00	7.3396E 05	8.7429E-01
8.5568E-02	3.3516E 00	2.2006E 04	2.7992E 01	3.8110E-01	3.8390E 00	6.8289E 05	8.9307E-01
1.0297E-01	3.2466E 00	2.6482E 04	2.8097E 01	4.5862E-01	4.5968E 00	8.2180E 05	8.9642E-01
1.0963E-01	2.8930E 00	2.8194E 04	2.8450E 01	4.8826E-01	4.1587E 00	8.7491E 05	9.0770E-01
1.1603E-01	2.6372E 00	2.9840E 04	2.8706E 01	5.1676E-01	3.9025E 00	9.2598E 05	9.1586E-01
1.2217E-01	2.3845E 00	3.1419E 04	2.8959E 01	5.4412E-01	3.6258E 00	9.7500E 05	9.2392E-01
1.2857E-01	2.2346E 00	3.3065E 04	2.9109E 01	5.7262E-01	3.5705E 00	1.0261E 06	9.2870E-01
1.3497E-01	2.1849E 00	3.4711E 04	2.9159E 01	6.0112E-01	3.7205E 00	1.0771E 06	9.3029E-01
1.4137E-01	1.7914E 00	3.6356E 04	2.9552E 01	6.2962E-01	3.1081E 00	1.1282E 06	9.4285E-01
1.4777E-01	1.6946E 00	3.8002E 04	2.9649E 01	6.5812E-01	3.1325E 00	1.1793E 06	9.4593E-01
1.5417E-01	1.5980E 00	3.9648E 04	2.9745E 01	6.8662E-01	3.1472E 00	1.2303E 06	9.4902E-01
1.6056E-01	1.3114E 00	4.1294E 04	3.0032E 01	7.1512E-01	2.7380E 00	1.2814E 06	9.5816E-01
1.6696E-01	1.2172E 00	4.2939E 04	3.0126E 01	7.4361E-01	2.7401E 00	1.3325E 06	9.6117E-01
1.7362E-01	1.0762E 00	4.4651E 04	3.0267E 01	7.7325E-01	2.6402E 00	1.3856E 06	9.6566E-01
1.7976E-01	9.9242E-01	4.6231E 04	3.0351E 01	8.0061E-01	2.6423E 00	1.4346E 06	9.6834E-01
2.3292E-01	3.7364E-06	5.9903E 04	3.1343E 01	1.0374E 00	1.8529E 00	1.8589E 06	1.0000E 00

PI FOR COLES WAKE FUNCTION = -3.7978E-01

RUN NUMBER 76- 35

THIS DATA REDUCTION SHOT IS FOR AN ADIABATIC WALL

RECOVERY FACTOR = 0.8800

PRANDTL NUMBER = 0.8090

GAMMA = 1.4000

FREE-STREAM UNIT REYNOLDS NO. PER METER= 9.6351E 06

DELTA(CM) = 1.6497E 00

DELTA STAR(CM) = 2.3992E-01 DELTA STAR(CM) NEW = 2.3984E-01

THETA(CM) = 1.6753E-01 THETA(CM) NEW = 1.6780E-01

SHAPE FACTOR = 1.4321E 00 NEW SHAPE FACTOR = 1.4293E 00

SKIN FRICTION = 2.2500E-03

Y	PT2	TO/TOE	M	U/UE	T/TE	TBAR	RHO/RHOE	RHO*U/(RHOE*UE)
0.0	8.43002E-01	9.94284E-01	0.0	0.0	1.04400E 00	0.0	9.57850E-01	0.0
5.84200E-03	8.74900E-01	9.96301E-01	2.30953E-01	4.69904E-01	1.03508E 00	3.52773E-01	9.66109E-01	4.53979E-01
1.85420E-02	8.83500E-01	9.96832E-01	2.59773E-01	5.27946E-01	1.03274E 00	4.45733E-01	9.68296E-01	5.11209E-01
3.12420E-02	8.89500E-01	9.97199E-01	2.78012E-01	5.64572E-01	1.03113E 00	5.09932E-01	9.69814E-01	5.47530E-01
4.39420E-02	8.94000E-01	9.97472E-01	2.90886E-01	5.90372E-01	1.02992E 00	5.57763E-01	9.70946E-01	5.73219E-01
5.66420E-02	8.97500E-01	9.97685E-01	3.00489E-01	6.09586E-01	1.02899E 00	5.94947E-01	9.71823E-01	5.92410E-01
6.93420E-02	9.01600E-01	9.97933E-01	3.11331E-01	6.31247E-01	1.02791E 00	6.38328E-01	9.72848E-01	6.14107E-01
8.20420E-02	9.03600E-01	9.98053E-01	3.16473E-01	6.41508E-01	1.02738E 00	6.59304E-01	9.73348E-01	6.24410E-01
1.07442E-01	9.08600E-01	9.98352E-01	3.28944E-01	6.66362E-01	1.02607E 00	7.11584E-01	9.74592E-01	6.49431E-01
1.32842E-01	9.12300E-01	9.98572E-01	3.37847E-01	6.84076E-01	1.02511E 00	7.50199E-01	9.75508E-01	6.67322E-01
1.58242E-01	9.14600E-01	9.98708E-01	3.43245E-01	6.94803E-01	1.02451E 00	7.73876E-01	9.76078E-01	6.78182E-01
1.83642E-01	9.18100E-01	9.98914E-01	3.51291E-01	7.10776E-01	1.02360E 00	8.09948E-01	9.76942E-01	6.94387E-01
2.11582E-01	9.22700E-01	9.99183E-01	3.61566E-01	7.31141E-01	1.02242E 00	8.56984E-01	9.78075E-01	7.15110E-01
2.34442E-01	9.24700E-01	9.99297E-01	3.65931E-01	7.39782E-01	1.02190E 00	8.77006E-01	9.78568E-01	7.23927E-01
2.59842E-01	9.25700E-01	9.99354E-01	3.68088E-01	7.44049E-01	1.02164E 00	8.87017E-01	9.78814E-01	7.28285E-01
2.85242E-01	9.29200E-01	9.99555E-01	3.75539E-01	7.58777E-01	1.02075E 00	9.22136E-01	9.79674E-01	7.43353E-01
3.10642E-01	9.31200E-01	9.99668E-01	3.79718E-01	7.67029E-01	1.02024E 00	9.41840E-01	9.80164E-01	7.51815E-01
3.36042E-01	9.33700E-01	9.99807E-01	3.84876E-01	7.77204E-01	1.01960E 00	9.66312E-01	9.80779E-01	7.62265E-01
3.61442E-01	9.34700E-01	9.99863E-01	3.86921E-01	7.81236E-01	1.01934E 00	9.76005E-01	9.81026E-01	7.66413E-01
3.89382E-01	9.36700E-01	9.99973E-01	3.90961E-01	7.89195E-01	1.01883E 00	9.95233E-01	9.81516E-01	7.74608E-01
4.50342E-01	9.42200E-01	1.00027E 00	4.01841E-01	8.10599E-01	1.01743E 00	1.04672E 00	9.82870E-01	7.96714E-01
5.13842E-01	9.45800E-01	1.00045E 00	4.08782E-01	8.24228E-01	1.01651E 00	1.07898E 00	9.83760E-01	8.10842E-01
5.77342E-01	9.49300E-01	1.00062E 00	4.15407E-01	8.37215E-01	1.01561E 00	1.10901E 00	9.84630E-01	8.24347E-01
6.40842E-01	9.54300E-01	1.00085E 00	4.24653E-01	8.55306E-01	1.01432E 00	1.14890E 00	9.85885E-01	8.43233E-01
7.04342E-01	9.58300E-01	1.00101E 00	4.31885E-01	8.69423E-01	1.01327E 00	1.17766E 00	9.86902E-01	8.58035E-01
7.67842E-01	9.61300E-01	1.00112E 00	4.37218E-01	8.79813E-01	1.01248E 00	1.19673E 00	9.87676E-01	8.68970E-01
8.31342E-01	9.65800E-01	1.00126E 00	4.45076E-01	8.95091E-01	1.01127E 00	1.22072E 00	9.88860E-01	8.85119E-01
8.94842E-01	9.67900E-01	1.00131E 00	4.48683E-01	9.02087E-01	1.01069E 00	1.22962E 00	9.89422E-01	8.92545E-01
9.58342E-01	9.70900E-01	1.00137E 00	4.53781E-01	9.11960E-01	1.00985E 00	1.23931E 00	9.90243E-01	9.03062E-01
1.02184E 00	9.74900E-01	1.00140E 00	4.60473E-01	9.24882E-01	1.00871E 00	1.24583E 00	9.91370E-01	9.16900E-01
1.08534E 00	9.77400E-01	1.00140E 00	4.64597E-01	9.32822E-01	1.00797E 00	1.24551E 00	9.92097E-01	9.25450E-01
1.14884E 00	9.80400E-01	1.00137E 00	4.69492E-01	9.42224E-01	1.00705E 00	1.23995E 00	9.92998E-01	9.35626E-01
1.21234E 00	9.82900E-01	1.00132E 00	4.73522E-01	9.49941E-01	1.00626E 00	1.23057E 00	9.93774E-01	9.44027E-01
1.27584E 00	9.88400E-01	1.00109E 00	4.82243E-01	9.66557E-01	1.00444E 00	1.19132E 00	9.95583E-01	9.62288E-01
1.33934E 00	9.87500E-01	1.00114E 00	4.80827E-01	9.63867E-01	1.00475E 00	1.19975E 00	9.95276E-01	9.59314E-01
1.40284E 00	9.91000E-01	1.00093E 00	4.86300E-01	9.74243E-01	1.00352E 00	1.16272E 00	9.96493E-01	9.70827E-01
1.46634E 00	9.93000E-01	1.00077E 00	4.89393E-01	9.80081E-01	1.00279E 00	1.13555E 00	9.97222E-01	9.77359E-01
7.67842E-01	9.95500E-01	1.00054E 00	4.93222E-01	9.87280E-01	1.00183E 00	1.09487E 00	9.98170E-01	9.85473E-01
1.59334E 00	9.96000E-01	1.00049E 00	4.93985E-01	9.88710E-01	1.00164E 00	1.08565E 00	9.98366E-01	9.87095E-01
1.65684E 00	9.98500E-01	1.00020E 00	4.97774E-01	9.95792E-01	1.00063E 00	1.03480E 00	9.99372E-01	9.95167E-01
1.72034E 00	9.99500E-01	1.00007E 00	4.99281E-01	9.98598E-01	1.00021E 00	1.01208E 00	9.99788E-01	9.98386E-01
1.78384E 00	1.00000E 00	1.00000E 00	5.00035E-01	1.00000E 00	1.00000E 00	1.00000E 00	1.00000E 00	1.00000E 00

THE DATA

Y*US/DS	VEL DEF	Y+	U+	Y/D	C. WAKE	REY	U/U1
0.0	2.9179E 01	0.0	0.0	0.0	0.0	0.0	0.0
8.3478E-04	1.5468E 01	1.6237E 02	1.3711E 01	3.5412E-03	3.1973E 00	4.6907E 03	4.6990E-01
2.6495E-03	1.3774E 01	5.1534E 02	1.5405E 01	1.1239E-02	4.1378E 00	1.4888E 04	5.2795E-01
4.4643E-03	1.2705E 01	8.6832E 02	1.6474E 01	1.8938E-02	4.3141E 00	2.5085E 04	5.6457E-01
6.2790E-03	1.1953E 01	1.2213E 03	1.7227E 01	2.6636E-02	4.3847E 00	3.5282E 04	5.9037E-01
8.0938E-03	1.1392E 01	1.5743E 03	1.7787E 01	3.4334E-02	4.4364E 00	4.5479E 04	6.0959E-01
9.9085E-03	1.0760E 01	1.9272E 03	1.8419E 01	4.2032E-02	4.3272E 00	5.5676E 04	6.3125E-01
1.1723E-02	1.0460E 01	2.2802E 03	1.8719E 01	4.9730E-02	4.4194E 00	6.5873E 04	6.4151E-01
1.5353E-02	9.7353E 00	2.9862E 03	1.9444E 01	6.5127E-02	4.3682E 00	8.6268E 04	6.6636E-01
1.8982E-02	9.2184E 00	3.6921E 03	1.9961E 01	8.0523E-02	4.3711E 00	1.0666E 05	6.8408E-01
2.2612E-02	8.9054E 00	4.3981E 03	2.0274E 01	9.5919E-02	4.4650E 00	1.2706E 05	6.9480E-01
2.6241E-02	8.4393E 00	5.1040E 03	2.0740E 01	1.1132E-01	4.3828E 00	1.4745E 05	7.1078E-01
3.0234E-02	7.8451E 00	5.8806E 03	2.1334E 01	1.2825E-01	4.1823E 00	1.6988E 05	7.3114E-01
3.3500E-02	7.5929E 00	6.5159E 03	2.1586E 01	1.4211E-01	4.1814E 00	1.8824E 05	7.3978E-01
3.7130E-02	7.4684E 00	7.2219E 03	2.1711E 01	1.5750E-01	4.2844E 00	2.0863E 05	7.4405E-01
4.0759E-02	7.0387E 00	7.9278E 03	2.2140E 01	1.7290E-01	4.1209E 00	2.2903E 05	7.5878E-01
4.4389E-02	6.7979E 00	8.6338E 03	2.2381E 01	1.8830E-01	4.0948E 00	2.4942E 05	7.6703E-01
4.8018E-02	6.5010E 00	9.3397E 03	2.2678E 01	2.0369E-01	4.0098E 00	2.6982E 05	7.7720E-01
5.1648E-02	6.3933E 00	1.0046E 04	2.2796E 01	2.1909E-01	4.0587E 00	2.9021E 05	7.8124E-01
5.5640E-02	6.1511E 00	1.0822E 04	2.3028E 01	2.3603E-01	4.0179E 00	3.1264E 05	7.8920E-01
6.4351E-02	5.5266E 00	1.2516E 04	2.3653E 01	2.7298E-01	3.7995E 00	3.6159E 05	8.1060E-01
7.3424E-02	5.1289E 00	1.4281E 04	2.4050E 01	3.1147E-01	3.7380E 00	4.1258E 05	8.2423E-01
8.2498E-02	4.7499E 00	1.6046E 04	2.4429E 01	3.4996E-01	3.6612E 00	4.6356E 05	8.3721E-01
9.1572E-02	4.2220E 00	1.7811E 04	2.4957E 01	3.8845E-01	3.4395E 00	5.1455E 05	8.5531E-01
1.0065E-01	3.8101E 00	1.9576E 04	2.5369E 01	4.2694E-01	3.2923E 00	5.6553E 05	8.6942E-01
1.0972E-01	3.5069E 00	2.1341E 04	2.5672E 01	4.6543E-01	3.2170E 00	6.1652E 05	8.7981E-01
1.1879E-01	3.0612E 00	2.3106E 04	2.6118E 01	5.0392E-01	3.0125E 00	6.6750E 05	8.9509E-01
1.2787E-01	2.8570E 00	2.4871E 04	2.6322E 01	5.4241E-01	2.9923E 00	7.1849E 05	9.0209E-01
1.3694E-01	2.5689E 00	2.6635E 04	2.6610E 01	5.8091E-01	2.8940E 00	7.6948E 05	9.1196E-01
1.4601E-01	2.1919E 00	2.8400E 04	2.6987E 01	6.1940E-01	2.7149E 00	8.2046E 05	9.2488E-01
1.5509E-01	1.9602E 00	3.0165E 04	2.7219E 01	6.5789E-01	2.6460E 00	8.7145E 05	9.3282E-01
1.6416E-01	1.6859E 00	3.1930E 04	2.7493E 01	6.9638E-01	2.5357E 00	9.2243E 05	9.4222E-01
1.7324E-01	1.4607E 00	3.3695E 04	2.7718E 01	7.3487E-01	2.4592E 00	9.7342E 05	9.4994E-01
1.8231E-01	9.7583E-01	3.5460E 04	2.8203E 01	7.7336E-01	2.1668E 00	1.0244E 06	9.6656E-01
1.9138E-01	1.0543E 00	3.7225E 04	2.8125E 01	8.1185E-01	2.3260E 00	1.0754E 06	9.6387E-01
2.0046E-01	7.5157E-01	3.8990E 04	2.8428E 01	8.5034E-01	2.1719E 00	1.1264E 06	9.7424E-01
2.0953E-01	5.8121E-01	4.0754E 04	2.8598E 01	8.8883E-01	2.1210E 00	1.1774E 06	9.8008E-01
1.0972E-01	3.7117E-01	2.1341E 04	2.8808E 01	4.6543E-01	6.7629E-01	6.1652E 05	9.8728E-01
2.2768E-01	3.2943E-01	4.4284E 04	2.8850E 01	9.6581E-01	2.0803E 00	1.2793E 06	9.8871E-01
2.3675E-01	1.2278E-01	4.6049E 04	2.9056E 01	1.0043E 00	1.9897E 00	1.3303E 06	9.9579E-01
2.4583E-01	4.0917E-02	4.7814E 04	2.9138E 01	1.0428E 00	1.9973E 00	1.3813E 06	9.9860E-01
2.5490E-01	0.0	4.9579E 04	2.9179E 01	1.0813E 00	2.0354E 00	1.4323E 06	1.0000E 00

PI FOR COLES WAKE FUNCTION = -1.1613E 00

RUN NUMBER 76- 31

THIS DATA REDUCTION SHOT IS FOR AN ADIABATIC WALL

RECOVERY FACTOR = 0.8800

PRANDTL NUMBER = 0.8090

GAMMA = 1.4000

FREE-STREAM UNIT REYNOLDS NO. PER METER= 9.7829E 06

DELTA(CM) = 1.5438E 00

DELTA STAR(CM) = 1.6734E-01 DELTA STAR(CM) NEW = 1.6716E-01

THETA(CM) = 1.2012E-01 THETA(CM) NEW = 1.2046E-01

SHAPE FACTOR = 1.3930E 00 NEW SHAPE FACTOR = 1.3877E 00

SKIN FRICTION = 2.5683E-03

Y	PT2	TO/TOE	M	U/UE	T/TE	TBAR	RHO/RHOE	RHO*U/(RHOE*UE)
0.0	8.43002E-01	9.94284E-01	0.0	0.0	1.04400E 00	0.0	9.57850E-01	0.0
5.84200E-03	8.78500E-01	9.96523E-01	2.43456E-01	4.95110E-01	1.03410E 00	3.91705E-01	9.67027E-01	4.78785E-01
1.85420E-02	8.89500E-01	9.97199E-01	2.78012E-01	5.64572E-01	1.03113E 00	5.09932E-01	9.69814E-01	5.47529E-01
3.12420E-02	8.98500E-01	9.97746E-01	3.03175E-01	6.14956E-01	1.02873E 00	6.05594E-01	9.72074E-01	5.97782E-01
4.36880E-02	9.04100E-01	9.98083E-01	3.17743E-01	6.44042E-01	1.02725E 00	6.64548E-01	9.73472E-01	6.26957E-01
5.66420E-02	9.06100E-01	9.98203E-01	3.22776E-01	6.54076E-01	1.02673E 00	6.85524E-01	9.73970E-01	6.37050E-01
6.93420E-02	9.11600E-01	9.98530E-01	3.36177E-01	6.80756E-01	1.02529E 00	7.42889E-01	9.75335E-01	6.63965E-01
8.20420E-02	9.16100E-01	9.98797E-01	3.46721E-01	7.01706E-01	1.02412E 00	7.89449E-01	9.76449E-01	6.85180E-01
1.07442E-01	9.19100E-01	9.98972E-01	3.53551E-01	7.15258E-01	1.02334E 00	8.20118E-01	9.77188E-01	6.98942E-01
1.32842E-01	9.23700E-01	9.99240E-01	3.63755E-01	7.35475E-01	1.02216E 00	8.66995E-01	9.78322E-01	7.19531E-01
1.58242E-01	9.30200E-01	9.99611E-01	3.77634E-01	7.62916E-01	1.02049E 00	9.31988E-01	9.79919E-01	7.47596E-01
1.83642E-01	9.32700E-01	9.99752E-01	3.82826E-01	7.73162E-01	1.01985E 00	9.56618E-01	9.80534E-01	7.58111E-01
2.09042E-01	9.34700E-01	9.99863E-01	3.86921E-01	7.81236E-01	1.01934E 00	9.76005E-01	9.81026E-01	7.66413E-01
2.34442E-01	9.38200E-01	1.00005E 00	3.93962E-01	7.95104E-01	1.01845E 00	1.00953E 00	9.81884E-01	7.80700E-01
2.59842E-01	9.39200E-01	1.00011E 00	3.95948E-01	7.99012E-01	1.01819E 00	1.01891E 00	9.82131E-01	7.84734E-01
2.85242E-01	9.46800E-01	1.00050E 00	4.10691E-01	8.27972E-01	1.01625E 00	1.08772E 00	9.84008E-01	8.14731E-01
3.10642E-01	9.49300E-01	1.00062E 00	4.15407E-01	8.37214E-01	1.01561E 00	1.10901E 00	9.84630E-01	8.24346E-01
3.36042E-01	9.51800E-01	1.00074E 00	4.20058E-01	8.46321E-01	1.01497E 00	1.12951E 00	9.85255E-01	8.33842E-01
3.61442E-01	9.56800E-01	1.00095E 00	4.29188E-01	8.64162E-01	1.01367E 00	1.16717E 00	9.86518E-01	8.52511E-01
3.86842E-01	9.58800E-01	1.00103E 00	4.32778E-01	8.71165E-01	1.01314E 00	1.18099E 00	9.87030E-01	8.59865E-01
4.50342E-01	9.56800E-01	1.00095E 00	4.29188E-01	8.64161E-01	1.01367E 00	1.16717E 00	9.86518E-01	8.52511E-01
5.13842E-01	9.59300E-01	1.00105E 00	4.33670E-01	8.72903E-01	1.01301E 00	1.18417E 00	9.87159E-01	8.61694E-01
5.77342E-01	9.65800E-01	1.00126E 00	4.45076E-01	8.95091E-01	1.01127E 00	1.22072E 00	9.88860E-01	8.85119E-01
6.40842E-01	9.68900E-01	1.00133E 00	4.50390E-01	9.05396E-01	1.01041E 00	1.23327E 00	9.89693E-01	8.96064E-01
7.04342E-01	9.75900E-01	1.00141E 00	4.62132E-01	9.28079E-01	1.00841E 00	1.24615E 00	9.91659E-01	9.20338E-01
7.67842E-01	9.77400E-01	1.00140E 00	4.64597E-01	9.32822E-01	1.00797E 00	1.24551E 00	9.92097E-01	9.25450E-01
8.31342E-01	9.85900E-01	1.00121E 00	4.78302E-01	9.59063E-01	1.00529E 00	1.21262E 00	9.94742E-01	9.54019E-01
8.94842E-01	9.86400E-01	1.00119E 00	4.79093E-01	9.60559E-01	1.00512E 00	1.20880E 00	9.94908E-01	9.55678E-01
9.58342E-01	9.87400E-01	1.00115E 00	4.80668E-01	9.63565E-01	1.00478E 00	1.20054E 00	9.95242E-01	9.58981E-01
1.02184E 00	9.89500E-01	1.00103E 00	4.83961E-01	9.69815E-01	1.00405E 00	1.18020E 00	9.95962E-01	9.65899E-01
1.08534E 00	9.91500E-01	1.00089E 00	4.87074E-01	9.75705E-01	1.00334E 00	1.15636E 00	9.96673E-01	9.72459E-01
1.14884E 00	9.92500E-01	1.00082E 00	4.88618E-01	9.78620E-01	1.00297E 00	1.14286E 00	9.97036E-01	9.75720E-01
1.21234E 00	9.92500E-01	1.00082E 00	4.88618E-01	9.78620E-01	1.00297E 00	1.14286E 00	9.97036E-01	9.75720E-01
1.27584E 00	9.94500E-01	1.00064E 00	4.91692E-01	9.84408E-01	1.00222E 00	1.11203E 00	9.97786E-01	9.82228E-01
1.33934E 00	9.95500E-01	1.00054E 00	4.93222E-01	9.87280E-01	1.00183E 00	1.09487E 00	9.98170E-01	9.85473E-01
1.40284E 00	9.97000E-01	1.00038E 00	4.95503E-01	9.91552E-01	1.00124E 00	1.06642E 00	9.98762E-01	9.90324E-01
1.46634E 00	9.97000E-01	1.00038E 00	4.95503E-01	9.91552E-01	1.00124E 00	1.06642E 00	9.98762E-01	9.90324E-01
1.52984E 00	9.98000E-01	1.00026E 00	4.97017E-01	9.94380E-01	1.00083E 00	1.04576E 00	9.99166E-01	9.93551E-01
1.59334E 00	9.99000E-01	1.00013E 00	4.98526E-01	9.97193E-01	1.00042E 00	1.02352E 00	9.99579E-01	9.96772E-01
1.65684E 00	9.98500E-01	1.00020E 00	4.97774E-01	9.95792E-01	1.00063E 00	1.03480E 00	9.99372E-01	9.95166E-01
1.72034E 00	9.99500E-01	1.00007E 00	4.99281E-01	9.98598E-01	1.00021E 00	1.01208E 00	9.99788E-01	9.98386E-01
1.76860E 00	1.00000E 00	1.00000E 00	5.00035E-01	1.00000E 00	1.00000E 00	1.00000E 00	1.00000E 00	1.00000E 00

THE DATA

Y*US/DS	VEL DEF	Y+	U+	Y/D	C. WAKE	REY	U/UI
0.0	2.7311E 01	0.0	0.0	0.0	0.0	0.0	0.0
1.2797E-03	1.3789E 01	1.7613E 02	1.3522E 01	3.7841E-03	2.0038E 00	4.7626E 03	4.9511E-01
4.0615E-03	1.1892E 01	5.5903E 02	1.5419E 01	1.2010E-02	2.4446E 00	1.5116E 04	5.6457E-01
6.8434E-03	1.0516E 01	9.4193E 02	1.6795E 01	2.0237E-02	2.4019E 00	2.5470E 04	6.1496E-01
9.5696E-03	9.7217E 00	1.3172E 03	1.7590E 01	2.8298E-02	2.4155E 00	3.5616E 04	6.4404E-01
1.2407E-02	9.4477E 00	1.7077E 03	1.7864E 01	3.6689E-02	2.5836E 00	4.6177E 04	6.5408E-01
1.5189E-02	8.7190E 00	2.0906E 03	1.8592E 01	4.4915E-02	2.4759E 00	5.6530E 04	6.8076E-01
1.7971E-02	8.1468E 00	2.4735E 03	1.9165E 01	5.3142E-02	2.4018E 00	6.6884E 04	7.0171E-01
2.3535E-02	7.7767E 00	3.2393E 03	1.9535E 01	6.9594E-02	2.5361E 00	8.7591E 04	7.1526E-01
2.9098E-02	7.2245E 00	4.0051E 03	2.0087E 01	8.6047E-02	2.5207E 00	1.0830E 05	7.3548E-01
3.4662E-02	6.4751E 00	4.7709E 03	2.0836E 01	1.0250E-01	2.3717E 00	1.2901E 05	7.6292E-01
4.0226E-02	6.1953E 00	5.5367E 03	2.1116E 01	1.1895E-01	2.4104E 00	1.4971E 05	7.7316E-01
4.5789E-02	5.9747E 00	6.3025E 03	2.1337E 01	1.3540E-01	2.4547E 00	1.7042E 05	7.8124E-01
5.1353E-02	5.5960E 00	7.0683E 03	2.1715E 01	1.5186E-01	2.4089E 00	1.9113E 05	7.9510E-01
5.6917E-02	5.4893E 00	7.8341E 03	2.1822E 01	1.6831E-01	2.4755E 00	2.1183E 05	7.9901E-01
6.2481E-02	4.6983E 00	8.5999E 03	2.2613E 01	1.8476E-01	2.2146E 00	2.3254E 05	8.2797E-01
6.8044E-02	4.4459E 00	9.3657E 03	2.2865E 01	2.0121E-01	2.1940E 00	2.5325E 05	8.3721E-01
7.3608E-02	4.1972E 00	1.0132E 04	2.3114E 01	2.1767E-01	2.1674E 00	2.7396E 05	8.4632E-01
7.9172E-02	3.7099E 00	1.0897E 04	2.3601E 01	2.3412E-01	2.0240E 00	2.9466E 05	8.6416E-01
8.4736E-02	3.5187E 00	1.1663E 04	2.3793E 01	2.5057E-01	2.0120E 00	3.1537E 05	8.7116E-01
9.8645E-02	3.7099E 00	1.3578E 04	2.3601E 01	2.9170E-01	2.2716E 00	3.6714E 05	8.6416E-01
1.1255E-01	3.4712E 00	1.5492E 04	2.3840E 01	3.3283E-01	2.3095E 00	4.1890E 05	8.7290E-01
1.2646E-01	2.8652E 00	1.7407E 04	2.4446E 01	3.7397E-01	2.1600E 00	4.7067E 05	8.9509E-01
1.4037E-01	2.5838E 00	1.9321E 04	2.4728E 01	4.1510E-01	2.1470E 00	5.2244E 05	9.0540E-01
1.5428E-01	1.9643E 00	2.1236E 04	2.5347E 01	4.5623E-01	1.9664E 00	5.7421E 05	9.2808E-01
1.6819E-01	1.8347E 00	2.3150E 04	2.5477E 01	4.9736E-01	2.0034E 00	6.2598E 05	9.3282E-01
1.8210E-01	1.1181E 00	2.5065E 04	2.6193E 01	5.3849E-01	1.7608E 00	6.7774E 05	9.5906E-01
1.9601E-01	1.0769E 00	2.6979E 04	2.6234E 01	5.7962E-01	1.8244E 00	7.2951E 05	9.6057E-01
2.0992E-01	9.9508E-01	2.8894E 04	2.6316E 01	6.2075E-01	1.8634E 00	7.8128E 05	9.6357E-01
2.2383E-01	8.2441E-01	3.0808E 04	2.6487E 01	6.6188E-01	1.8563E 00	8.3305E 05	9.6981E-01
2.3774E-01	6.6352E-01	3.2723E 04	2.6648E 01	7.0301E-01	1.8494E 00	8.8481E 05	9.7571E-01
2.5165E-01	5.9391E-01	3.4637E 04	2.6727E 01	7.4415E-01	1.8763E 00	9.3658E 05	9.7862E-01
2.6556E-01	5.8391E-01	3.6552E 04	2.6727E 01	7.8528E-01	1.9365E 00	9.8835E 05	9.7862E-01
2.7947E-01	4.2585E-01	3.8466E 04	2.6886E 01	8.2641E-01	1.9205E 00	1.0401E 06	9.8441E-01
2.9338E-01	3.4741E-01	4.0381E 04	2.6964E 01	8.6754E-01	1.9386E 00	1.0919E 06	9.8728E-01
3.0728E-01	2.3072E-01	4.2295E 04	2.7081E 01	9.0867E-01	1.9364E 00	1.1437E 06	9.9155E-01
3.2119E-01	2.3072E-01	4.4210E 04	2.7081E 01	9.4980E-01	1.9860E 00	1.1954E 06	9.9155E-01
3.3510E-01	1.5349E-01	4.6124E 04	2.7158E 01	9.9093E-01	1.9977E 00	1.2472E 06	9.9438E-01
3.4901E-01	7.6670E-02	4.8039E 04	2.7235E 01	1.0321E 00	2.0076E 00	1.2990E 06	9.9719E-01
3.6292E-01	1.1494E-01	4.9953E 04	2.7196E 01	1.0732E 00	2.0690E 00	1.3507E 06	9.9579E-01
3.7683E-01	3.8298E-02	5.1868E 04	2.7273E 01	1.1143E 00	2.0756E 00	1.4025E 06	9.9860E-01
3.8740E-01	0.0	5.3323E 04	2.7311E 01	1.1456E 00	2.0888E 00	1.4418E 06	1.0000E 00

PI FOR COLES WAKE FUNCTION = -2.0923E 00

Data Tabulation Nomenclature for Table 1

I. PAGE 1 - HEADINGS

Parameters identified with "NEW" have been obtained from mean velocity profiles which have additional points added to the profile in the sublayer region, $y^+ < 140$. The added velocities were obtained from the relation

$$u^+ = \tan^{-1}(0.09y^+)/0.09$$

II. PAGE 2

Y	Normal distance from wall (cm)
PT2	Ratio of local to free-stream (fs) values of total pressure
TO/TOE	Ratio of local to fs values of total temperature
M	Local Mach number
U/UE	Ratio of local to fs values of velocity
T/TE	Ratio of local to fs values of static temperature
TBAR	Ratio of difference of local total temperature and fs total temperature to difference of adiabatic wall and fs total temperatures
RHO/RHOE	Ratio of local to fs values of static density
RHO*U/ (RHOE*UE)	Ratio of local to fs values of mass flux

III. PAGE 3

Y*US/DS	YU*/δ*, U* is friction velocity
VEL DEF	$(U_\infty - U)/U^*$
Y^+	y U*/ν, ν is the kinematic viscosity
u^+	U/U*
Y/D	y/δ
C.WAKE	Coles' wake function = $2(u^+ - 2.5\ \ell n\ y^+ - 5.5)/\ (u_E^+ - 2.5\ \ell n\delta^+ -5.5)$
REY	RE times Y, RE is the unit Reynolds number
U/U1	U/UE

APPENDIX A
SUMMARY OF ALTERNATE MEASUREMENT TECHNIQUE

A summary of experience gained in the development and use of a hot-wire anemometer (HWA) and a laser velocimeter (LV) is given in this Appendix. This information is presented as an Appendix because the fluctuation data which were obtained using these alternate measurement techniques were either not self-consistent or were insufficient to allow meaningful conclusions to be drawn. Therefore, these data do not alter the basic conclusions discussed in the main body of this report. However, based on the mean flow measurements using the HWA and LV systems (these measurements will be shown to be, in general, in good agreement with the pitot pressure data reported in the main body of this report) it will be demonstrated that these systems are working mean flow diagnostic tools in the ART.

A-1 THE HOT-WIRE ANEMOMETER

The hot-wire electronics employed in this study consisted of a Thermo Systems, Inc.® (TSI) model 1054B anemometer, model 1051-1 power supply, model 1076 true rms/d-c/mean square voltmeter, and a model 1015C correlator. Two probe configurations were studied: (1) a TSI model 1248-10 cross array cylindrical film (0.025-mm diameter), and (2) a TSI model 1288 split film (0.5-mm diameter). All probes were calibrated using a TSI model 1125 calibrator. These system components were several years old (i.e., five years or older) and several units were found to be unreliable. However, the greatest barrier to obtaining high quality fluctuation data was found to be the limited frequency response of the system. An investigation has shown this problem to be attributable to two sources: (1) use of film probes of relatively large diameter and (2) long uncompensated line lengths between the probe and the electronics.

Calibration procedures for compressible flow were not generally available for the transonic flow regime at the time this investigation was initiated. Therefore, the Mach number range was held to the low subsonic range (i.e., M = 0.5). Calibration curves were obtained for mass flux (ρu) as a function of signal voltage for constant wire and gas total temperature. All probes were calibrated before use and upon completion of a test phase, which generally extended over a period of several weeks. It was found that for this study the calibrations did not change significantly over a period of several weeks.

Figure A-1 shows typical cross array data obtained with the test section extension in place and with and without additional free-stream vorticity. For comparison, data obtained from a pitot probe survey are included in Fig. A-1. The pitot data are indicated by the solid symbols. The mean velocity profile indicates good agreement between these two measurement techniques. However, examination of the velocity fluctuations, in particular, the Reynolds shear stress, $\langle\tilde{u}\tilde{v}\rangle/u_\infty^2$, reveals the data to be inconsistent. That is, near the wall the shear stress in a turbulent boundary layer can be expected to be approximately constant. In this case, the following approximate relation between C_f and $\rho\langle\tilde{u}\tilde{v}\rangle$ should exist near the wall

$$\frac{\tau_w}{\frac{1}{2}\rho u_\infty^2} \equiv C_f \approx -\frac{\rho\langle\tilde{u}\tilde{v}\rangle}{\frac{1}{2}\rho u_\infty^2} = -2\frac{\langle\tilde{u}\tilde{v}\rangle}{u_\infty^2}$$

Using this relation, Fig. A-1a, e.g., indicates $C_f \approx 4.5 \times 10^{-4}$ based on the measured shear, and $C_f = 2.10 \times 10^{-3}$ based upon the mean profile. The probable causes of this disparity were noted above.

An example of split film data is presented in Fig. A-2. Good agreement between the mean velocity profiles measured by the split film and a pitot probe was obtained. However, the fluctuation data exhibit inexplicable trends and the value of C_f inferred from the measured shear stress and the mean profile are found to be inconsistent. In addition to the frequency response difficulties noted above, these data suffer to

a large extent from inexperience with appropriate calibration and data reduction procedures. Investigations such as Spencer and Jones (Ref. A-1) and Sandburn and Seegmiller (Ref. A-2) indicate that extreme care must be taken in the calibration procedure to obtain meaningful measurements. Thus, while useful fluctuation data were not acquired during the course of this investigation with the split film probe, it appears that the major problem of limited frequency response can be overcome with appropriate electronics.

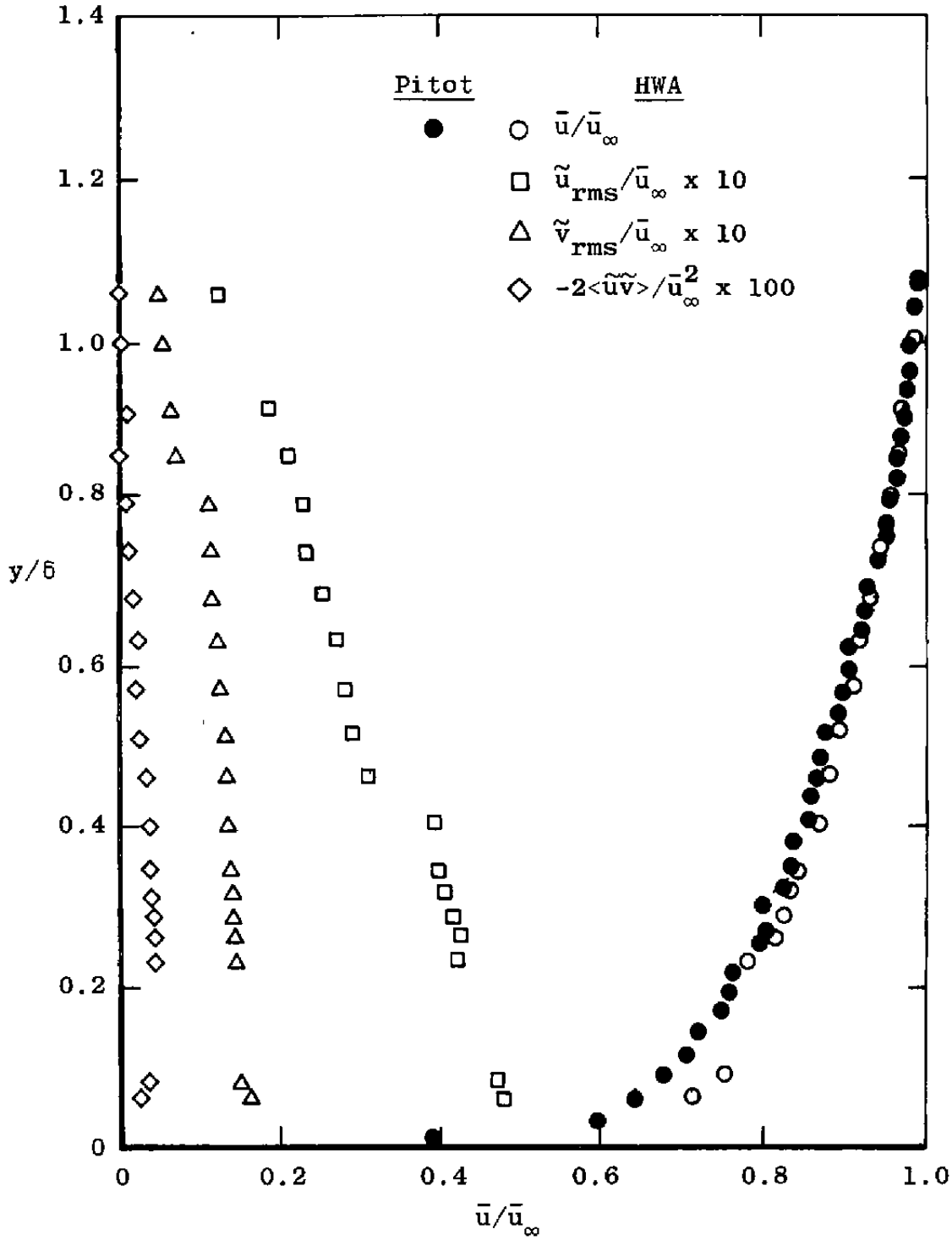
A-2 THE LASER VELOCIMETER

During the course of this investigation, the ART was equipped with a two-component LV which is operated in the forward scatter mode for maximum signal-to-noise ratio. The basic operational theory of LV measurement is described in Ref. A-5. Because the system utilizes moving fringes, it is possible to measure a two-dimensional velocity vector (i.e., magnitude and direction). The basic techniques and theory of Doppler-shifted fringes are described in Refs. A-3 and A-4. The entire LV system is mounted on a three-axis Icon Corp. traverse which provides probe volume position accuracies of 0.0025 cm. The traverse and test section support structure are mounted on an inertial mass to minimize vibration-induced relative motion.

The heart of the ART LV system is a Coherent Radiation®, Argon-Ion Laser which furnishes 1.5 watts of power at 6,487 Å. A light beam from the laser is passed through an optics package which splits the beam into four parts, doppler shifts the vertical and horizontal fringes, and focuses the beams at a point in the test section (see Fig. A-3). A two-component Bragg cell provides a 45-MHz frequency shift to the vertical and a 15-MHz shift to the horizontal fringes. The focal volume allows a closest approach of 0.025 cm to the tunnel wall or model surface.

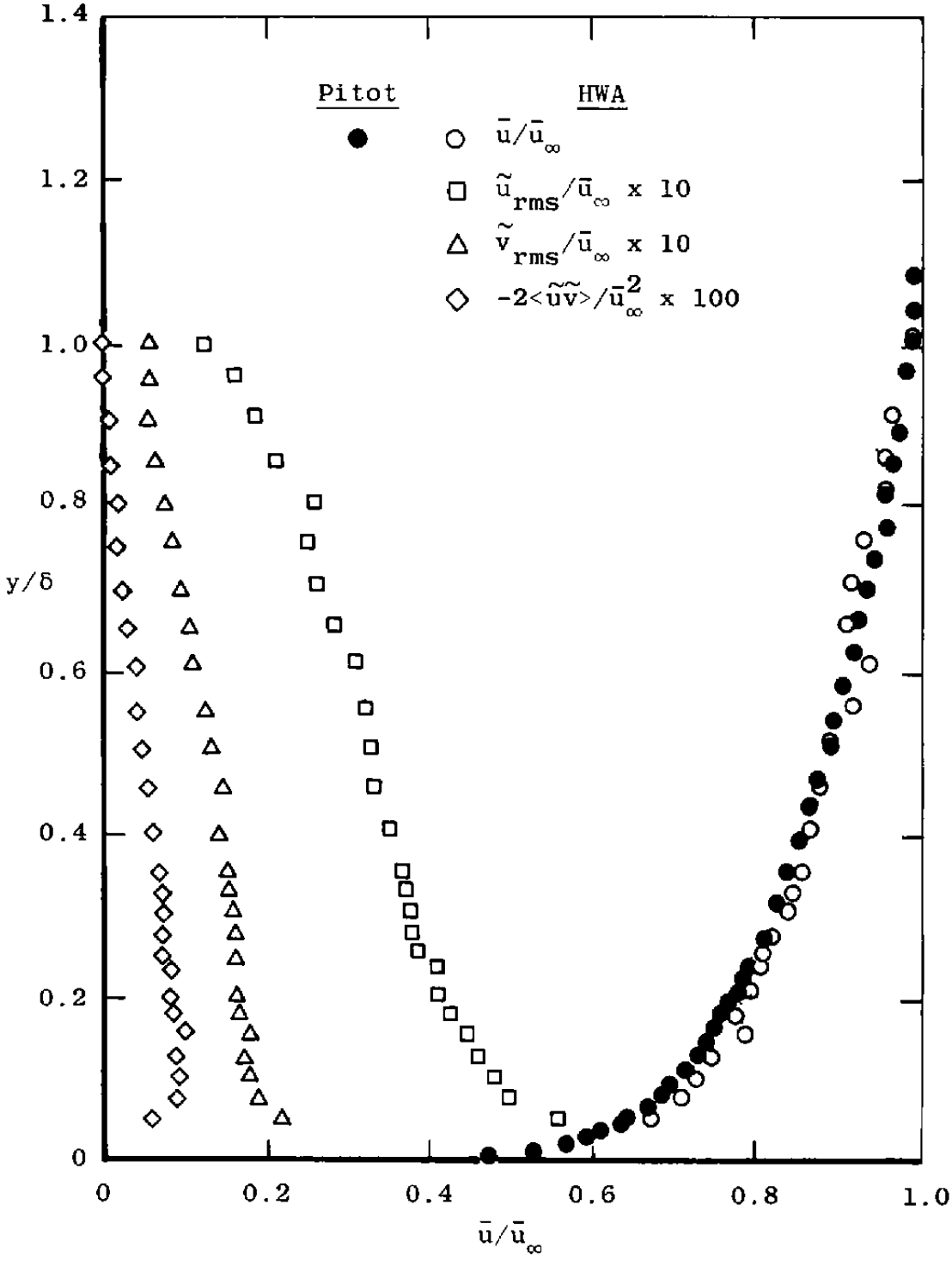
An offaxis lens system is utilized to collect the scattered radiation and focus it into a photomultiplier tube (931-A) which detects and amplifies the signal. This signal is processed by a Model 8 Doppler Data Processor (see Ref. A-6) which employs various tests to determine data acceptability. Acceptable data sets consisting of two velocity components and a time of reading are passed to a data acquisition system for reduction. Typically, this system consists of an LSI-2 minicomputer which has a 32K memory storage capacity and has a sample rate of 36K data sets per second. When a preset number of samples (generally 1,000) has been collected, the mean values of vertical and horizontal velocity were determined and output. In addition, the original stored data were transferred to a 9-track magnetic tape. A manual input capability was included so that part/point and test condition information could be recorded. Additional data reduction was accomplished offline using standard data reduction programs developed for LV data. A new online system was also available. This system which is described in Ref. A-7 was capable of processing 300K data sets per second. Such high sample rates suggests the possibility of making online mean and turbulent velocity measurements.

Figure A-4 gives an example of mean and turbulent velocity profiles as determined by the data acquisition system. These data were acquired at x = 89.7 cm and the mean profile compares well with pitot data taken at x = 88.8 cm under identical flow conditions. These data are self-consistent in that C_f = 0.0028 from the mean velocity profile and C_f = 0.0025 from the turbulent shear stress measurement, $-\rho\langle\tilde{u}\tilde{v}\rangle$. The extensive scatter observed in the LV data is attributed to taking samples over a period of sufficient length compared to fluctuations in the flow to obtain an accurate average. The data of Fig. A-4 indicate that the LV system is an extremely promising flow diagnostic tool.



a. Baseline

Figure A-1. Cross Array Data at x = 137.2 cm.



b. Vortical disturbances
Figure A-1. Concluded.

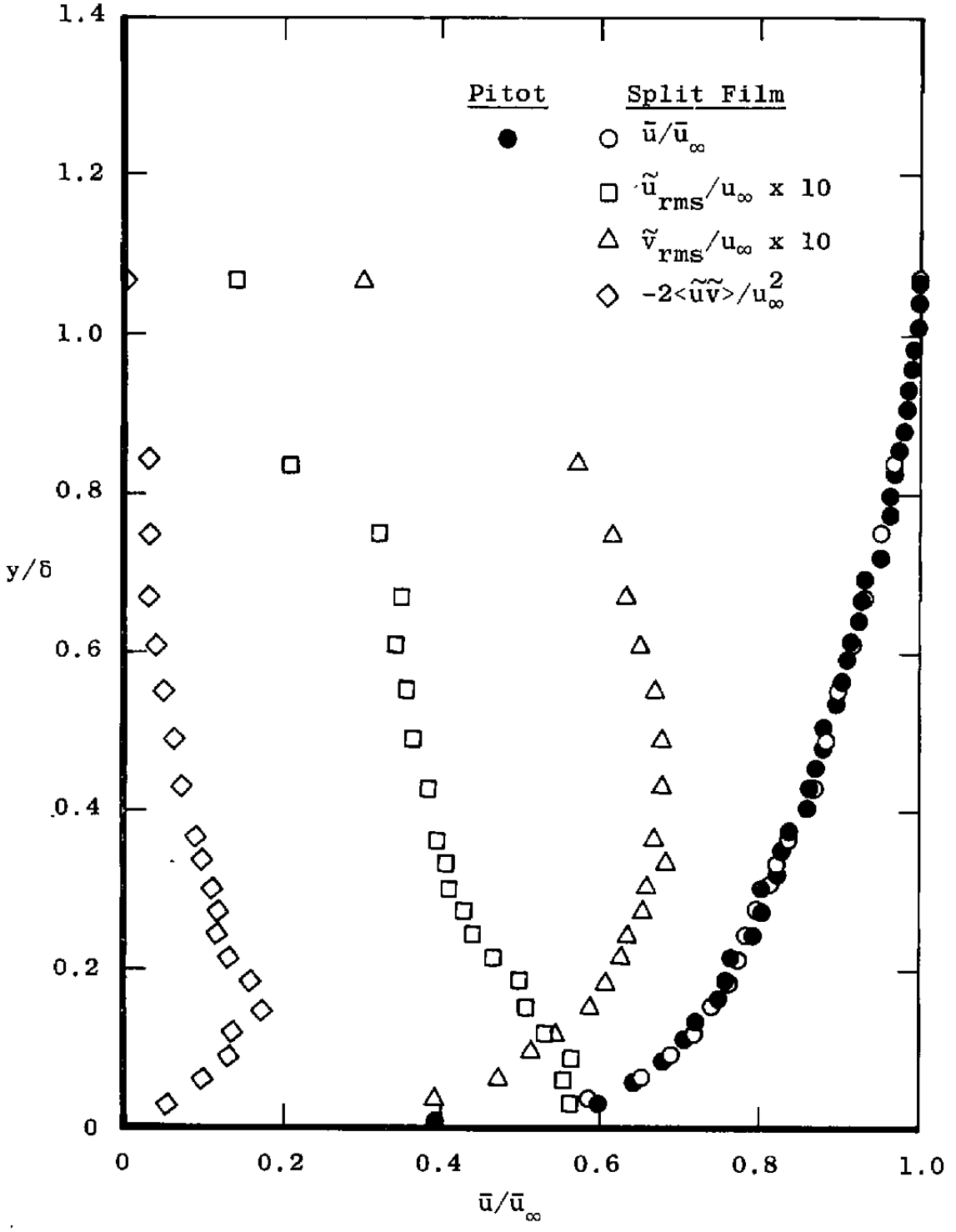


Figure A-2. Baseline split film data at x = 137.2 cm.

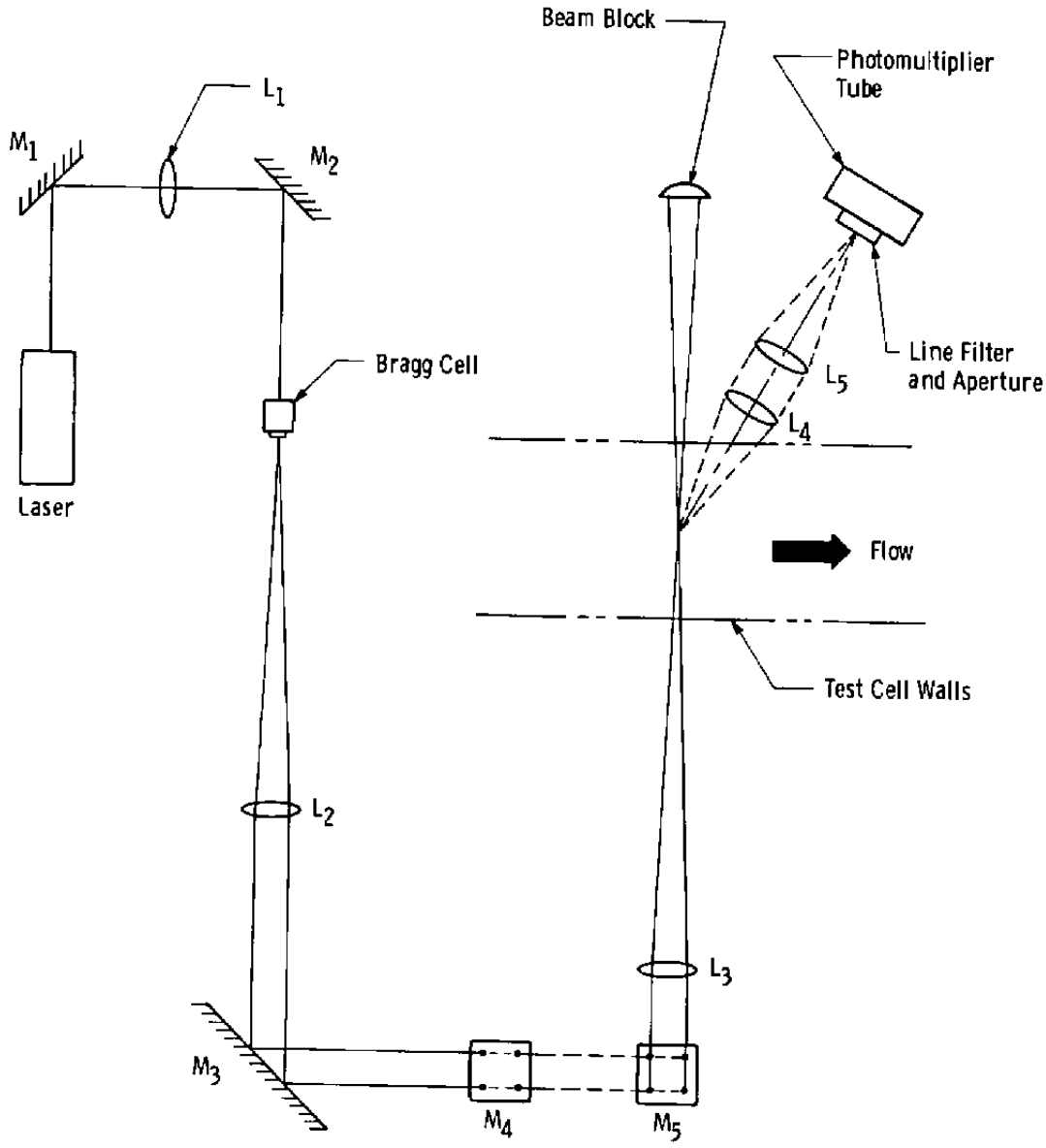


Figure A-3. Schematic of ART LV system.

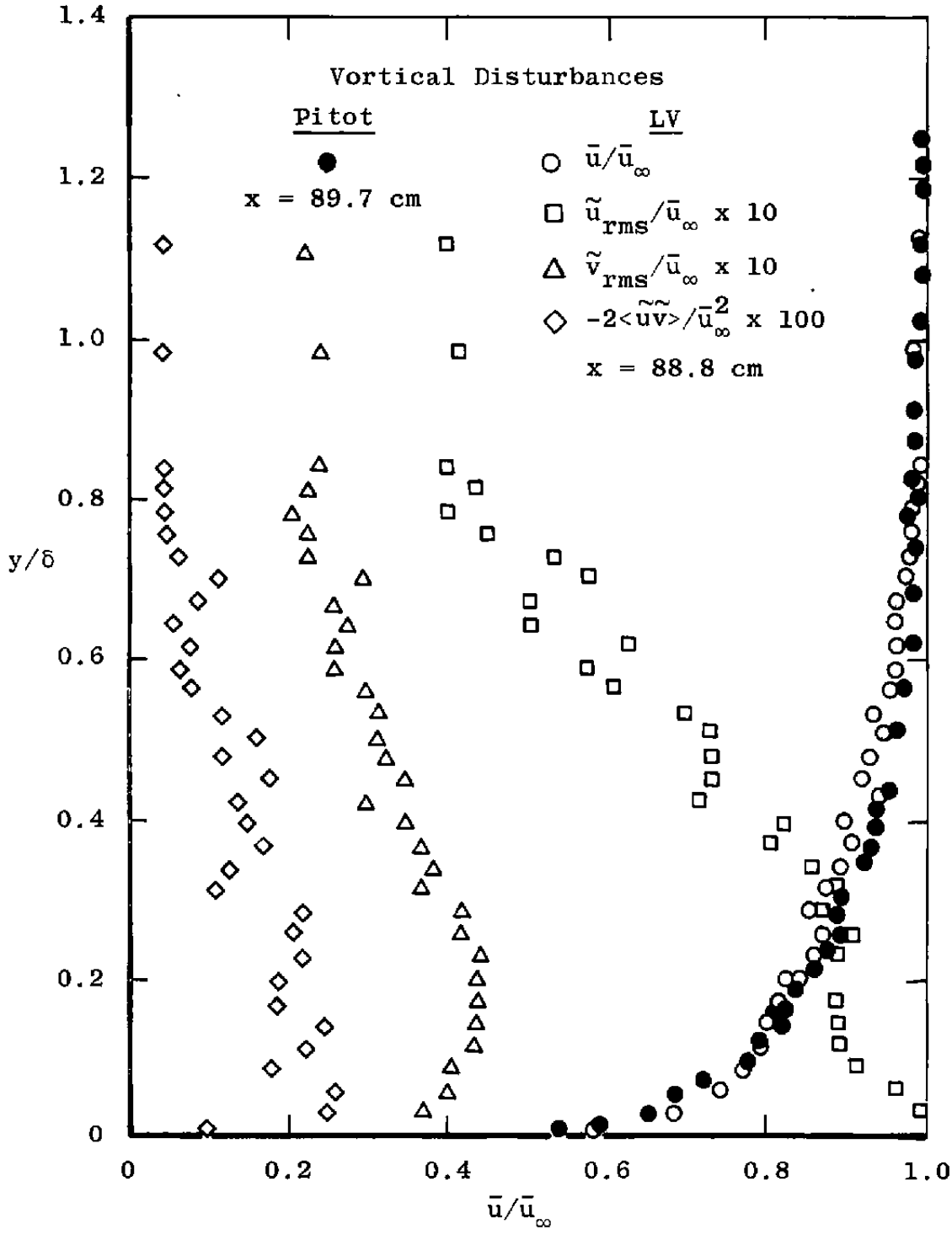


Figure A-4. Mean and turbulent velocity distributions inferred from LV measurements.

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NOMENCLATURE

C_f	Local skin friction coefficient
C_p	Specific heat at constant pressure
H	Shape factor
K	Molecular thermal conductivity
K_t	Eddy thermal conductivity
M	Mach number
Pr_m	Mixed Prandtl number, $c_p\ (\mu + \mu_t)/(K + K_t)$
P_S	Local static pressure
P_T	Local total pressure
$\tilde{p}$	Fluctuating wall static pressure
q	Dynamic pressure
$\tilde{q}^2$	Turbulent kinetic energy = $\frac{1}{2}\ (\langle\tilde{u}^2\rangle + \langle\tilde{v}^2\rangle + \langle\tilde{w}^2\rangle)$
R	Unit Reynolds number, (m^{-1})
R_x	Reynolds number based on distance from the boundary-layer trip
R_θ	Reynolds number based on θ
u	Streamwise velocity component

u^+ Law of the wall variable, $\sqrt{u/u_\tau}$

u^* Wall friction velocity, $\sqrt{\tau_w/\rho_w}$

u_τ Nondimensional wall friction velocity, u^*/u_∞

v Velocity component normal to wall

x Streamwise boundary-layer coordinate

y Boundary-layer coordinate normal to wall

y^+ Law of the wall variable, $y\ u_\tau/\nu_w$

δ Boundary-layer thickness taken at $u/u_\infty \approx 0.995$ unless otherwise noted

δ^* Displacement thickness

θ Momentum thickness

μ Molecular viscosity

μ_t Eddy viscosity

ρ Density

$\rho\tilde{u}\tilde{v}$ Instantaneous Reynolds stress

τ_w Wall shear stress

ν_w Kinematic viscosity evaluated at wall conditions

SUBSCRIPTS

rms Root-mean-square value, e.g., $\tilde{u}_{rms} = \sqrt{\langle \tilde{u}^2 \rangle}$

∞ Free-stream value

SUPERSCRIPTS (except as noted)

~ Fluctuating value

SPECIAL NOTATION

$\langle \cdot \rangle$ Indicates time average, e.g., $\langle \tilde{u}^2 \rangle = \frac{1}{T} \int_0^T \tilde{u}^2(t)dt$